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THE UNIVERSITY OF ALBERTA

CREATIVITY: A STUDY OF RELATIONSHIPS

(C)

by

MARGARET LUCILLE DAVISON

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF EDUCATION

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

EDMONTON, ALBERTA

Fall, 1988

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THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled "Creativity: A Study of Relationships," submitted by Margaret Lucille Davison in partial fulfilment of the requirements for the degree of Master of Education in Educational Psychology.

.....
Supervisor

.....

.....

Date: October 5, 1988

DEDICATION

This thesis is dedicated to the memory of my parents, Arthur Gerow and Ruby Webster. They were gifted in their approach to living and learning, always appreciative of our best efforts.

ABSTRACT

This study of 60 higher ability Grade 5 children in the Edmonton, Alberta area investigated relationships between creativity and intelligence, academic achievement, gender, age, occupation and education of each parent, number of children in the family, birth order, and instructional program. Creativity was assessed by the Torrance Tests of Creative Thinking.

It was found that there is a positive relationship between IQ and some aspects of Figural creativity, but not with Verbal creativity. Some relationships, both positive and negative, were found to exist between creativity and a few academic subjects. There was no relationship between creativity and gender. Age was consistently positively correlated with Verbal creativity, but only minimally with Figural creativity.

Although creativity of the child was found not to correlate with occupation of the mother, it did correlate with occupation of the father. Similarly, no relationship was found between the creativity of the child and education of the mother, and a minimal relationship was found for the father's education, with that being in Figural creativity. Number of children in the family was found to be positively correlated with Verbal creativity but not Figural creativity. It was found that there is a relationship between program of instruction and Figural creativity, with children in gifted programs scoring higher than children in regular programs. The importance of considering creativity in educational programming, especially for higher ability children, was emphasized.

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> Creativity as process is important not because the product of each moment is such a gem, but because the process is the essence of life itself.
>
> H.H. Anderson
> In B. Clark, Growing Up Gifted

CHAPTER I

INTRODUCTION

We hear the blending of many voices. A certain electricity seems to permeate the air in the room. Some children are in clusters, a number very animated and gesturing freely as they share their separate foci of attention. Several are intent upon a lengthy paper on a desk, debating modifications to a hand-drawn design. A few girls have made a seating arrangement for their dolls that have been invited for the day. One boy is writing, as if being pushed for time. One adult moves among the others present, alert, but unobtrusive. The starting bell has not yet sounded.

This would appear to be a situation that could be conducive to the stimulation of creativity. How do some of the other factors, including intelligence, achievement, familial circumstances, and program, influence the extent to which these students actually engage in productive creative thinking? This study aims to explore relationships between creativity and such factors.

Rationale

Why focus upon creativity? In Gold's words (1982:103), "the release of creativity is ... argued on social grounds, on the needs of the world in times of crisis for original, 'emergent' approaches rather

than the extension of trends already established." The importance "lies not only in social need ... but also in individual self realization -- the development of man, as an ideal." If this release of creativity, in positive directions, is deemed truly important by educators, then schools need to identify creative students and to include them in programs which can facilitate their potential breakthroughs.

Not only do creative enterprises benefit society, but also they enrich the individual. A person's healthy involvement in fully realizing his or her potential leads to a high level of functioning, that which Maslow terms "self-actualization" and which approaches "creativeness" (1971:57). Such people can happily and productively use a creative problem-solving approach in dealing with the vicissitudes of life. In Maslow's words, we "must teach people to be creative" (1971:98).

Testing for creativity can give educators results that may be used to advantage in planning educational programs that could possibly facilitate creativity in individuals. Torrance noted that results of creativity tests can reveal "potentialities that might otherwise go unnoticed" (1974a:6). The scores, in conjunction with other information gleaned, could well be used in a diagnostic manner, especially in planning individualized programs. One of the methods of using such results is to build upon the strengths and to use these in improving upon the weaknesses. Torrance also suggested that these test results could be used as sources of clues for remedial programs, recognizing that the more highly creative are not immune to having personal problems (1974a:5-6).

Justification for pursuing the development of creativity in education of children can be found in official government documents. For example, in the province of Alberta "the ultimate aim of education is to develop the abilities of the individual in order to fulfill personal aspirations while making a positive contribution to society" (Alberta Education, 1986:2-1). With regard to the education of the gifted and talented, with these possibly including a number who are potentially creative, the rationale states: "Alberta Education supports the provision of educational programs for exceptional students who have special needs, whether the students are gifted, talented, or educationally disabled" (Alberta Education, 1986:2-2). I consider these statements a challenge to educators to create appropriate opportunities for individual students, including those who may make creative contributions.

Of related relevance is the role of creativity in the acquisition of general knowledge. Wright (1987:33) cited Getzels and Jackson, stating, "The development of creative thinking is at the heart of achievement in even the most basic educational objectives." With the current thrust in Alberta, for example, toward strengthening the basic subject areas, creative ways of achieving such goals can not only facilitate the process but can also develop creative problem-solving skills.

In summary, the development of creativity is considered important for educational as well as personal and societal reasons. With provision by some governments of programs for the gifted and talented, including the potentially creative, there is official recognition of

this educational need. The enrichment of the individual through the achievement of higher levels of functioning, and possibly increased creativeness, is deemed valuable in itself as well as for society.

The Problem

The main purpose of this research was to study creativity in higher-ability elementary school children. Sixty students in Edmonton area schools were examined in terms of whether a relationship exists between creativity and intelligence scores, gender, age, academic achievements, family circumstances, and program.

Research Questions

The questions from which the study emanated were as follows:

1. Is there a relationship between creativity and intelligence?
2. Is there a relationship between creativity and academic achievement?
3. Is there a relationship between creativity and gender?
4. Is there a relationship between creativity and age?
5. Is there a relationship between the creativity of the child and the following family circumstances:
   - 5.1 the family structure?
   - 5.2 the socioeconomic status of the family, as determined by the occupation of each/either parent?
   - 5.3 the educational background of each/either parent?
   - 5.4 the number of children in the family?
   - 5.5 the birth order of the child?

6. Is there a relationship between creativity and instructional program?

Limitations of the Study

The structure of the sample excluded a number of students at the chosen grade level. For testing convenience, a minimum of five students were selected in each qualifying school and, because of IQ restrictions, only larger schools had the required number. Schools were selected as only approximately representative of the socioeconomic range in the Edmonton area. Of further restriction was the inclusion of Identified Gifted and their relatively small numbers in the overall school population.

IQ data were gathered from existing records, and different tests were treated as equivalent. Time did not permit the administration of individual tests and the results used were from testing in either Grade 3 or Grade 4, plus one from Grade 2 and one from Grade 5. The scores used were from the 1967 Lorge Thorndike and the 1974 Canadian Cognitive Abilities Test as well as two 1974 WISC-R test results.

The use of the Torrance Tests of Creative Thinking (TTCT) could be criticized. Despite their wide use, their validity has been questioned, with Nuttall, for example, (1984:572) stating that the manual does not convincingly show that the tests "do measure creative abilities in such a way as to identify individuals with creative potential." Amabile (1983:25-26) also questioned their validity since many of the creativity tests "are validated against one another." However, many studies have used the TTCT and also the improved reliability and validity that could be achieved by having a composite score, as suggested by Nuttall, could

possibly have been reached in the Torrance Test Creativity Index (Torrance and Ball, 1984:7).

With respect to testing, several points could be made. There was only one TTCT testing session, with the assumption that all students were equally ready to do their creative best at that time and place. Secondly, applicable to the TTCT as well as the IQ test results, group tests are not as reliable as individual tests. However, the group test results were the practical option for this study.

The data gathered were to a degree dependent upon the careful cooperation of a number of people, with the possibility of human error. School personnel were asked to assist, including the provision of a list of students who qualified in terms of IQ and from which subjects were chosen. Cumulative record information regarding academic grades was expected to reflect accurately and fairly the individual's actual performance.

Significance of the Study

With increased attention in recent years to the education of the gifted, and with some of the gifted potentially creative, research-based information on creativity is deemed of importance. Testing for creativity and using the results to assist in planning appropriate individualized programs could well be a recommended practice, should educators truly wish to efficiently maximize student potential. The relationships that exist between creativity and the intellectual, academic, personal, educational, and familial factors, as found in this research, could aid in understanding how best to access creative problem-solving abilities, a much needed skill in adapting to a fast-

changing world. The urgency is stressed in Khatena's (1987:139) obituary to Gowan, stating that "society must maximize such potential [of the gifted and talented] if it is to avoid disaster."

Defining creativity is easy, about as easy as putting socks on an octopus.
S.W. Tiedt, Creativity

CHAPTER II

REVIEW OF THE LITERATURE

Theorizing and research about creativity have been extensive. The aspects of this elusive concept covered in this study are those that appear to underlie the Torrance tests. In this chapter, some definitions and categorizations of theories are presented. Stages in the general creative process are provided, including references to possible application in the testing process of this study. A brief historical background to the Torrance tests is given, as well as a description of the Torrance tests and the creative processes presumed to be operating in each of the Verbal and Figural batteries, and an overview of other selected creativity tests. Of particular relevance to the problem under study is the section on research studies involving relationships between creativity and the factors being investigated in this study.

Definitions of Creativity

The descriptions of creativity given by theorists and researchers reflect their personal orientations. These may be categorized and labeled in various ways, for example as Clark (1983:32) has done. To Clark (1983:30), creativity is the highest expression of giftedness. Clark's four categories of creative functions are incorporated into her "creativity circle." These sectors are: (a) rational thinking; (b) feeling (high levels of emotional development or feeling); (c) sensing

(high levels of mental and physical development); and (d) intuitive (higher levels of consciousness, resulting in use of imagery, fantasy, and breakthroughs to the preconscious or unconscious states) (1983:33).

Rational Thinking Creative Functioning

Some of the definitions of creativity that seem pertinent to this study include those which Clark groups under "rational thinking." This view "has accumulated the most literature and nearly all of the testing" (Clark, 1983:33).

Citing Clark (1983:33), some of the definitions selected in this category, along with the names of the researchers, are as follows:

> Torrance (1962) - "the process of sensing gaps or disturbing missing elements; forming new hypotheses and communicating the results, possibly modifying and retesting the hypotheses" (p. 16).
>
> Parnes (1967) - "Creativity is a function of knowledge, imagination, and evaluation" (p. 6). He sees the processes involved as fact finding, solution finding, and acceptance finding.
>
> Williams (1968) - An act of creativity is a conscious act of human intelligence. Operationally, he defines it as including knowledge, mental processes based on cognition, divergent-productive and associative thinking, evaluative behaviors, and communicative skills.
>
> Guilford (1959) - "Aptitude traits that belong most clearly logically in the area of creativity...fluency of thinking and flexibility of thinking, as well as originality, sensitivity to problems, redefinition and elaboration . . . classifiable in a group of divergent thinking abilities" (p. 160).
>
> Taylor (1959) - Interested most in scientific creative ability, he discusses five levels of creativity: expressive, productive, inventive, innovative, and emergenative. He views the steps in the process as mental labor, incubation, illumination, and deliberate effort.

Other Categories of Creative Thinking Functioning

With further reference to categories of creativity theories, Clark (1983:34) considers the other three sectors of her creativity circle as "probably more important" but they are "less easy to measure." Another of those who has recognized the limitations of focusing on only one aspect of creativity is Gowan.

Gowan (in Clark, 1983:47) pointed out the holistic nature of creativity and viewed subdivisions along a continuum. Gowan's (1972:7-8) categories, along with some of their proponents, are: (a) cognitive, rational and semantic (Dewey, Wallas, Rossman, Guilford); (b) personal and environmental (Fromm, Rogers, Maslow); (c) mental health and openness (Jung, Maslow, Rogers); (d) Freudian and Neo-Freudian (Kubie, Gowan); and (e) psychedelic (Janet, Freud, Myers).

Another concept of a continuum that presses broader thinking about creativity is that of Harman and Rheingold (1984:1-2). They compared creativity to light. There would be a "visible spectrum" in the middle, with the two extremes beyond this. At the low end could be the intuitive "infrareds," the "gut feelings," and the hunches. At the upper end could be the creative "ultraviolets," the extraordinary insights and inspirations. The recognized instances of creativity would be the visible spectrum of a "far vaster range of manifestations of the creative unconscious mind."

Creativity as Used in this Study

Historically, creativity has been studied mainly in terms of process, product, person, and program. This study deals with process and product as they are reflected in the objectives and results of the

Torrance Tests of Creative Thinking (TTCT). The levels of creativity of the person have been studied with respect to relationships between creativity and the individual's intelligence, academic achievement, gender, age, and family circumstances. Program is applicable in terms of the groupings from which the subjects were selected and in examining relationships between these and the creativity scores.

Torrance (1974a:9) referred to "creative abilities and tendencies as a 'constellation of general abilities, personality variables, and problem-solving traits' rather than as a particularized and substantive capacity." He considered that artists, writers, and musicians use these creative abilities in a process similar to that used by scientific investigators (1974a:9).

Stages in the Creative Process

Four stages in the creative process have been widely accepted. These, as proposed by Wallas in 1926, consist of preparation, incubation, illumination, and verification (Clark, 1983:37). Each step would appear to be part of the Torrance conception of creativity.

Preparation

Within the "preparation" stage there would initially be an identification of the problem and the subsequent fact-gathering period. Edwards' (1986:30) brain research findings separated this period into "first insight," the awareness and delineation of the problem, and "saturation." Harman and Rheingold (1984:81-82) described the saturation stage as a time of "programming and reprogramming the unconscious idea processor," with the input being "mental and vocal

repetitions of the ideas or images." Von Oech (1986:15) would recommend assuming the "explorer" role at this time and, rather than look in all the well-known directions, "poke around in unknown areas, pay attention to unusual patterns, and seek out a variety of different kinds of information."

This is the initial part of each activity in the TTCT. Within the time limits, the person is encouraged to write/draw many ideas (fluency) and to seek other unusual responses (flexibility, originality).

Incubation

In this stage of the creative process, the problem is set aside, out of the person's awareness. There are, however, mental processes taking place. The ideas and materials gathered during the preparation stage are, at a level below the conscious, "organized, elaborated upon, and reorganized in mysteriously new ways" (Tannenbaum, 1983:264).

In a testing situation this is pressed into a time frame. A setting of openness is given in the directions: "Think of something...that no one else will think of" and "Sometimes if you will just sit and think more ideas will come to you..." (Torrance, 1974b:5).

Illumination

This moment of inspiration, to Edwards (1986:41), may be the most mysterious of all the stages in the creative process. This has been expressed in many phrases, including "Aha!", "That's it! I see it now!", "Eureka! I've found it!" May (1975:66) gave a description of this as a personal suprarational experience, stating that the new form which suddenly becomes present does so "in order to complete an

incomplete Gestalt" with which the person has been struggling in conscious awareness. Torrance (1979:2) used the Japanese expression "satori" as the equivalent of this sudden flash of insight.

The product of this creative search can represent a real "leap" away from what has previously existed. To be termed "creative" it must be novel, at least to the creator, and something valued by the immediate society (Clark, 1987:7).

The TTCT yields scores that give an indication of not only the quantity of the responses but also the quality. The resistance to closure is believed to encourage greater originality and possible mental leaps.

Verification

In this last stage of the creative process, "a new idea needs to be verified and put into a form that makes it available for use by others" (Edwards, 1986:41). Torrance included this procedure in his definition.

The TTCT results are assumed to reflect the potential for novel ideas. They are available to others in visible form.

The Torrance Tests of Creative Thinking

Historical Background to the Torrance Tests (TTCT)

Early research about creativity and intelligence has been reviewed by various authors. Torrance (1974a:9) noted that Burnham, in 1892, distinguished "between reproductive imagination and creative productive imagination." Torrance (1974a:9) also commented on the work of Simpson (1922), with the latter recommending that "we should add tests of creative thinking ability to traditional tests of intelligence," that

is, that we evaluate a "vital creative energy" as well as the reproductive kinds of abilities.

A new focus on the importance of creativity began in 1950 with Guilford's challenge to view intelligent behavior as something more than IQ scores (Swassing, 1985:4). This led to his model of the structure of the intellect (SI), part of which distinguished between convergent and divergent production. Divergent production, the main thrust of creative thinking, includes the constructs of fluency, flexibility, originality, and elaboration. Torrance is said to have drawn heavily upon the divergent-production abilities presented by Guilford (Gallagher, 1985:306).

These factors of divergent production each measure different creative thinking abilities. Fluency refers to the number of ideas; flexibility, the variety of different approaches or categories of ideas; originality, the unusual, off-the-beaten-track ideas; and elaboration, the well developed and detailed ideas (Torrance, 1965:6).

However, Torrance and Ball (1984:1) intended that the Torrance tests be used for more than motivating divergent thinking. Clark (1983:427) stated that the intent of the [Torrance] tests is "to identify process abilities necessary for operating creatively."

The Torrance Tests of Creative Thinking (TTCT)

Over a period of 25 years, Torrance and his associates "developed several batteries of test activities for use in all cultures, from kindergarten through graduate and professional school" (Torrance and Ball, 1984:2). They tried to use activities that were "models of the creative thinking process, each involving different kinds of thinking"

(Torrance and Ball, 1984:2). In preliminary research for the tests of creative thinking, Torrance (1974:11) analyzed "thinking manifested by scientists, artists, writers, and others in making outstanding creative achievement." On this basis, these widely used tests of creativity have evolved.

Changes have been made in the tests and the scoring. The first test prepared by Torrance as a result of the extensive research was the Minnesota Test of Creative Thinking (1962), with the subsequent Torrance Tests of Creative Thinking (TTCT) being produced in 1966. Improvements in the manuals for administration and scoring have been made since then (Torrance, 1974a:3), and substantial changes have since been made in scoring the Figural tests (Torrance and Ball, 1984:3-4). The new streamlined scoring of the TTCT plus variations in administration aim "to capture the essence of those kinds of creativity that fall outside the realm of pure reason" (Torrance and Hall, 1981:84).

Creative Processes in the Verbal TTCT

In the Verbal battery, there are seven activities that are intended to measure creative thinking (Torrance, 1974:11-13). The Asking Activity elicits questions that will help fill in gaps in one's knowledge; the curiosity needed here is an important aspect of creativity, especially in scientific endeavors. The Guess Causes and Guess Consequences Activities can reveal the subject's ability to formulate hypotheses concerning cause and effect; hence, they concern both the thinking about causes as well as the less-used process of predicting possible consequences. Involved in the Product Improvement Activity is a playing with ideas, with the originality score being based

on the statistical infrequency and appropriateness of the response. The author's intent for the Unusual Uses Activity is to break mind set and to press beyond the ordinary, including different categories of responses and toward the more original. The Unusual Questions Activity is intended to push the ideas beyond the factual orientation. In the Just Suppose Activity there is "an attempt to elicit a higher degree of fantasy and to be more effective with children" (Torrance, 1974a:13).

The activities are scored for the creative thinking skills of Fluency, Flexibility, and Originality.

Creative Processes in the Figural TTCT

There are three activities in these batteries, with each meant to represent a different aspect of creativity (Torrance, 1974a:13-15). In the Picture Construction Activity, the person is invited to make an unusual, original picture, in which the given shape is an integral part, and to elaborate with added details. The Incomplete Figures Section is intended to stimulate the tendency toward structuring and integrating, with the subject also pulled toward delay of closure in order to produce a more original response. The subject must control the tension of this pull long enough to make the mental leap necessary to create the less commonplace. The Repeated Figures Activity, using either The Parallel Lines or Circles, according to the form used, challenges the subject to find a purpose for something and to elaborate upon it, "to make multiple associations to a single stimulus" (Torrance, 1974a:14). The scoring of the Figural TTCT, prior to 1984, was for Fluency, Flexibility, Originality, and Elaboration (Torrance, 1974a:15).

However, the more recent streamlined scoring system (Torrance and Ball, 1984:3) results in five norm-referenced measures and thirteen criterion-referenced indicators. The Figural TTCT has added "abstractness of titles" and "resistance to premature closure" to the original fluency, originality, and elaboration criteria. Figural Flexibility has been excluded, with this measure of the variety of categories now being subsumed in the other subscores. The scoring for originality and elaboration has been simplified. For the new Abstractness of Titles, the rationale is "based on the idea that creativity requires one to sense the essence of a problem...this is reflected in the level of abstraction given to the titles of the pictures drawn..." (Torrance and Ball, 1984:3). "Resistance to Premature Closure as a scoring concept is based on the generally accepted conclusion that creative behavior requires a person to 'keep open' in processing information and to consider a variety of information" (Torrance and Ball, 1984:3-4). The thirteen criterion-referenced indicators, which are seen by Torrance and Ball (1984:3) to identify potential creative strengths, are: emotional expressiveness, storytelling articulateness, movement or action, expressiveness of titles, synthesis of incomplete figures, synthesis of lines, unusual visualization, internal visualization, extending or breaking boundaries, humor, richness of imagery, colorfulness of imagery, and fantasy (1984:54). The scores from these have been used in calculating the Creativity Index, one of the main creativity scores used in this study.

The Creativity Index (CI) is a new composite score that has been added in this streamlined form of scoring the Figural TTCT. It is "the

mean standard score of the five norm-referenced figural measures plus the total number of criterion-referenced indicators" (Torrance and Ball, 1984:7).

Other Tests of Creative Thinking

Getzels and Jackson Tests

For their studies involving creativity, Getzels and Jackson (1962:16-19) used a battery of five creativity tests. Their basic assumption was that "these creative thinking abilities are found to some extent in all persons." The tests of creative potential used by Getzels and Jackson involved the ability to deal inventively with verbal and numerical symbol systems and with object space relations." Scoring was "on the number, novelty, and variety of adaptive responses to a given stimulus task." The five creativity measures used were: Word Association, Uses for Things, Hidden Shapes, Fables, and Make-up Problems.

Wallach and Kogan Tests

The Wallach and Kogan (1965) battery of creativity tests was based upon associations, using an untimed gamelike procedure. The students were tested individually. All the subtests contained both verbal and visual content and were scored separately for number and uniqueness of response (Tannenbaum, 1983:277-278).

Guilford's Creativity Tests for Children

Guilford's battery of Creativity Tests for Children (1973) are used to measure divergent production abilities. They were prepared for the Grade 4 to 6 level but can be used for adults as well. The abilities

tested are restricted to the two content areas of visual-figural and semantic. Since no single test is scored for more than one Structure of Intellect ability, a relatively low degree of redundancy is found (Guilford, 1975, 113-114).

Research Studies Involving Creativity

The presentation of research findings relevant to factors in this study follow the order of the research questions. The areas have not been given equal attention in past studies, and not all studies have employed the TTCT as the creativity instrument, in part or as a whole. However, the research reported does involve the measurement of creativity. Of further note, the studies reported have not used the current streamlined method for scoring the Figural TTCT or the subsequent Creativity Index score and, hence, my study offers some new detail.

Creativity and Intelligence

A number of studies have sought correlations between creativity and intelligence, but before proceeding with some historical data it is necessary to recognize that there are different perceptions of the scope of each term. One of the main causes for the variability found in the definition of creativity and intelligence is that creative talent is not "a single, comprehensive variable distinct but parallel to another supposed variable of general intelligence" (Guilford, 1971:77). Furthermore, tests of creativity are also somewhat variable in exactly what they use as criteria. In testing for creativity various measures have been used, with these being refined over the years.

Guilford's own studies, based on his three-dimensional Structure of the Intellect Model (SI), found the relationship between divergent-production test scores and IQ scores to be generally low, and he suggested that "although a high IQ did not guarantee doing well, being above average in IQ was almost a necessity" (Clark, 1979:247). Getzels and Jackson (1970:202) stated that Guilford "emphasized abilities in the area of convergent thinking and evaluation, often at the expense of development in the area of divergent thinking."

Another of the earlier major studies involving creativity and intelligence was that of Getzels and Jackson (1962:15-24). Students were selected from Grades 6 to 12 in an urban private school, all with IQs in the superior range. Of the two experimental groups, the high-lows were from the top 20% in IQ and the lower 80% in the creativity measure, whereas the low-highs were from the lower 80% in IQ and higher 20% in creativity.[1] The average IQ of the high-lows was 150, while that of the low-highs was 127. Getzels & Jackson (1962:25) found that "there was a relatively low relationship between the IQ metric and measures of creativity."

Barbe (1964:34), who included two tests from the Minnesota Battery of Tests of Creative Thinking in his study of Grades 3 to 6 gifted children, found no significant correlation between intelligence and creative thinking ability.

The Wallach and Kogan study (1965) was somewhat different (Guilford, 1971:79-83). Their own tests of divergent production were

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[1]The group names have been rephrased from the originals.

given to a sample of Grade five students, using a playful atmosphere and no time limits. They found no significant correlation between creativity and intelligence. Guilford critiqued this study, stating that since it was without time control the later minutes of the tests may have measured something different from what was measured during the first of the working period and, hence, creativity should have correlated higher with IQ scores than was shown in their results.

Yamamoto (1965:300-301) studied Grade five students of a broad IQ range and found linear correlations between IQ and the creativity score. He used a creativity index dervied from a total of five tests of the Minnesota Tests of Creative Thinking. However, he found "a consistent decrease in size of the correlation as the level of IQ of the sub-groups became higher ..."

Wade (1968:98) reviewed creativity research and found that the correlation between creativity and intelligence was from .18 to .55.

Over many years Torrance contributed much to the study of creativity, including that of the relationship between creativity and intelligence. His basic studies in this area started in 1959 (Torrance, 1977:177). Prior to 1964, Torrance made eight replications of the Getzels and Jackson study, with seven showing some relationship between creativity and IQ (Gowan, 1964:75); however, the IQ level for the Torrance samples was not as high and the results were not the same in a rural or parochial area (Gallagher, 1975:56). Torrance (1967:147) summarized all available evidence with respect to the relationship between creativity and intelligence, tabulating 178 correlation coefficients. He found a median correlation of .20, with the

correlation between intelligence and verbal creativity being .21 and that with nonverbal creativity .06.

Renzulli (1978:184) noted that divergent thinking is indeed a characteristic of highly creative persons but cautioned with respect to the use and interpretation of tests designed to measure this capacity.

MacKinnon (1978:16) reported that, in the groups assessed, measured intelligence was not significantly related to creativity. However, the subjects involved were all above average intelligence, with some of extremely high intelligence. MacKinnon (1978:16) also reported finding that above an IQ of about 115 to 120 in their samples being more intelligent does not guarantee a corresponding increase in creativeness.

From Barron's (1969:42) reporting of a study of architects, the generalization was made that "for certain intrinsically creative activities a specifiable minimum is probably necessary in order to engage in the activity at all, but beyond that minimum, which is often surprisingly low, creativity has little correlation with scores on IQ tests." Barron (1969:43), however, gave a reminder about what is really being measured. "It is not intelligence that has little or no relationship with creativity, but intelligence tests."

In Tuttle and Becker (1980:52) there was a further reminder that "the Torrance tests may measure areas different from those measured by IQ tests." The authors referred to a study of gifted individuals, reported by Gaier (1976), which found low correlations between Torrance test scores and IQ.

Ehrlich (1982:12) stated that the traits of creativity and intelligence are not necessarily independent; it is possible for a

person to be highly intelligent without being highly creative, but it is not likely that one will be highly creative without having "at least above-average or superior intellectual abilities."

In summary, there appears to be some overlap between creativity and intelligence. For higher ability groups, however, studies generally show a lack of significant correlation between creativity and IQ.

Creativity and Achievement

Creativity has been found to bear some relationship to school achievement. It is necessary to point out that there is generally a lower relationship when achievement is measured by teacher grades than when measured by standardized tests (Torrance, 1967:150).

In Getzels and Jackson's study (1962:23) the achievement of the higher creativity/lower IQ students was equal to that of the higher IQ/lower creativity group. Furthermore, in academic achievement both groups were significantly superior to their school population.

Runco (1986:376) referred to Wallach and Wing's study, reported in 1965, dealing with the accuracy of divergent thinking tests in predicting achievement of high school students. Their findings were that there was a relationship in areas of leadership, art, writing, and science but not in areas of social service, drama, and music.

Razik (1970:163) presented the results of studies by Barron and MacKinnon, which indicated that highly creative adults rarely had straight As in school. Rather, the grades were about a B average for architects and somewhere between C and B for research scientists. "Many of the subjects had grades that would not admit them to graduate study today" (Razik, 1970:163).

Wallach (1976:57) stated that "tests tell us little about talent." High academic test scores do not necessarily reflect the potential for creative/productive accomplishment.

In Hocevar's (1976:869) study of college students, positive correlations of low and moderate magnitude were obtained among indices of creativity in fine arts, performing arts, math-science, literature, and music; the concept of creativity for his study was based on ideational fluency, using Guilford's Alternate Uses, Plot Titles, and Consequences tests, plus the Concepts Mastery Test (Hocevar, 1980:25).

The moderate relationships that have been found between creativity and achievement have varied. Some of this variation could be attributed to the differences in testing instruments used, and some could relate to the idiosyncratic thrust of the individual's creative potential, in figural or verbal directions, or in different areas of interest such as in arts/fine arts and/or in math-science and/or in leadership or other less-academic orientations.

In summary, no consistent evidence has been found to relate creativity and achievement.

Creativity and Gender

In the studies reported here, the word "gender" has been substituted for the original word "sex." In the studies located, gender was not a primary focus.

Torrance (1967:147) "consistently obtained small but positive, and sometimes statistically significant relationships" between creativity and intelligence, with these being rather consistently "higher for girls than for boys." This held true for the verbal over figural, and for

fluency and elaboration over originality.

Yamamoto (1967:315) found low correlation between measures of creative thinking and those of intelligence, with this relationship slightly higher for girls than for boys.

In Kogan and Pankove's (1972:427) longitudinal study, creativity and IQ were found to be unrelated at Grade 5. However, at the Grade 10 level, there was a positive correlation for males but no correlation for the females.

The study by Aldous (1973) of family background factors and originality in children found no significant differences with respect to gender.

In the Hocevar (1976:869) study of college students with respect to relationships among creativity in mathematics-science, literature, and music, more values reached statistical significance for males than for females.

In summary, no consistent relationships have been found between creativity and gender. Several researchers have found significant relationships between creativity and intelligence, with these being slightly higher for girls than for boys. On the other hand, there is an indication that for older students and those in college, the relationship between creativity and intelligence is higher for boys than girls. Thus, the overall evidence is inconclusive.

Creativity and Age

No research was found that specifically studied creativity and age, but one study was found that reported a change over time, and some literature referred to the Grade 4 slump in creativity. Kogan and

Pankove's (1972:427) longitudinal study found creativity and IQ unrelated at Grade 5 but related, for males only, at Grade 10. Torrance studied the fourth grade slump in creativity, finding that discontinuities in creative development "occur whenever the children of that culture are confronted with new stresses and demands," for example in about Grade 4 in our culture (Clark, 1983:38).

Creativity and Family Circumstances

Creativity and Family Structure

The variable of family structure was not noted in many of the studies overviewed. The results of one study are presented.

Barbe's (1964:15) study found that 90% of highly gifted and moderately gifted elementary school children were from families in which the parents were married and living together. Five of the 130 subjects reported cases of divorce, three from families of the moderately gifted and two from the highly gifted.

Because of the lack of evidence, partly through the paucity of available research, no relationship can be postulated between creativity and family structure.

Creativity and Socioeconomic Status/Occupations of the Parents

In my study, socioeconomic status was measured by the level of occupation of the mother and/or the father, but the research that was located examined either one or the other of these two variables. Hence, the review presents the discussion under two separate headings.

Socioeconomic Status of the Family. The issue of socioeconomic status has been covered in a number of studies related to high ability

children. One of these studies specifically noted using the TTCT.

Gallagher (1985:41) reported that Terman's pre-1950 studies of gifted children found high ratings of social status.

Barbe's (1964:16) study showed that the more highly gifted group (>148 IQ) of grades 3 to 6 children came from wealthier family backgrounds than did the moderately gifted.

The Smith study (1965) reported by Torrance (1974a:60), "found positive relationships between scores on the verbal creative thinking tests and socioeconomic status and negative relationships between scores on the figural tasks and socioeconomic status.

In the study by Williams, Tuebner, and Marlow (1973:111) of 237 North Dakota Grade 4 children, using the TTCT, significant differences were found between socioeconomic status and verbal creativity but not for figural creativity. Using the F-test for five groups of children, the significant differences were for verbal fluency, flexibility, and originality, with the mean creativity scores from highest to lowest being for rural, urban middle income, urban lower income, Indian lower income, and Indian impoverished.

In another study of family background factors and originality in children (Aldous, 1973), it was found that middle-class children scored higher than working-class children.

Goertzel's 1979 study of 300 eminent personalities, as reported by Krippner (1983:87), showed that the eminent person is likely to be from a middle-class family.

Occupation of the Parents. A few studies were found that related creativity to occupations of the parents. The occupational levels were

of a more general nature than those investigated in my study.

The Getzels and Jackson (1962:63) study (in a university area) showed that the fathers of the high IQ group were mainly in professions, whereas the majority of the fathers of the high creativity group were in business. The mothers of the high IQ group were mainly housewives while the majority of mothers of the high creativity group were employed on a full- or part-time basis.

In Barbe's (1964:28) study, more of the fathers of the highly gifted were in professional levels.

Schaefer's 1970 study of ten exceptionally creative adolescent girls, reported by Clark (1983:44), found that most of the mothers worked outside the home.

Goertzel's 1979 research, reported in Krippner (1983:87), found that the father of an eminent person was likely to be a business man or professional.

In summary, the socioeconomic status of the families of gifted children was likely to be at least middle class whereas the families of specifically creative children were from a broader range of income levels. The higher creativity children had fathers who were mainly in business and in the professions and mothers who were employed outside the home.

Creativity and Education of the Parents

Only a few studies were located that related creativity to education of the parents. The levels of education considered were relatively general.

The Getzels and Jackson (1962:62-64) study found significantly greater specialization of training or "professionalization of education" in the high IQ group. More of the fathers than the mothers in both groups were college graduates, and the same obtained for the number of those with graduate training.

In the Barbe (1964:17) study, the parents of the highly gifted both had more education than the parents of the moderately gifted. On average, the fathers of the highly gifted had more education than the mother, whereas the fathers of the moderately gifted did not.

Schaefer's 1970 study (Clark, 1983:44) of exceptionally creative girls found the parents to be well educated.

As a summary, in the few studies located, there was a higher level of education in parents of highly gifted/creative children, with the fathers having more education than the mothers.

Creativity and Number of Children in the Family

Only one study was found that referred to the relationship between creativity and number of children in the family. The Barbe (1964:15) study found that the average family size for the two groups, the moderately gifted and the highly gifted, was 3 for both.

Creativity and Birth Order

A number of studies were found that related creativity to birth order.

In the Barbe (1964:15) study, the majority of each group, the moderately and the highly gifted, were first born.

Aldous (1973) found that oldest boys and only girls were the most original.

Guilford (1977:166) reported that "the most creative individuals were likely to be the first-born, or among the early children in the family."

Goertzel's research, noted in Krippner (1983:87), found that an eminent person was likely to be first-born or an only child.

Jarial (1985:139) found that firstborns were significantly superior in creative thinking.

Albert and Runco (1986:339) found that the creative child is often an only child or, if not, is probably oldest.

To summarize, there is some evidence that there is a negative relationship between creativity and birth order.

Creativity and Family Circumstances: A Summary

In summarizing the results of the studies of creativity and family circumstances, there were relationships. It would appear that the more highly creative children came from families with a range of income levels, from farming to the professions. Fathers were often in business or from the professions and mothers were often employed. The parents were generally well educated, with the fathers at higher levels than the mothers, and the creative child could possibly be the first born.

Creativity and Instructional Programs

Only limited information is available in the literature regarding a relationship between creativity and instructional program. Only one study was found dealing with learning environment, or instructional

program.

Bachtold (1974:226-228) studied the effects of learning environment on the verbal creativity of gifted students. The Grades 5 and 6 students, all at or above the 98th percentile in IQ, were from three different instructional settings, either special class, enrichment, or part-time learning center. The learning centers involved interaction with materials and resource persons outside the regular classroom. By means of the Torrance Test of Creative Thinking, students were evaluated for fluency, flexibility, and originality. In this pre/post test, the part-time learning center students (with these comparable to the PO students of my study) showed the greatest increase in verbal creativity.

In summary, because of insufficient evidence, a definitive statement about the relationship of creativity and instructional program is premature at this time.

Summary

Information has been given in order to provide a background for understanding creativity as examined through use of the TTCT. Definitions in Clark's rational thinking category have been included, as well as an overview of other groupings. Steps in the creative process have been described. The processes intended to be probed by the TTCT have been presented in detail. Research studies investigating relationships between creativity and the variables focused on in this study have been reviewed.

> The creative man is someone who can see inside and come out with something fresh, something vital.
>
> Frank Lloyd Wright
> In S.W. Tiedt, Creativity

CHAPTER III

THE RESEARCH

This study of higher ability elementary school children explored the relationships between their creativity and selected variables. The variables were intelligence; achievement; gender; age; family structure; socioeconomic status, as evidenced in occupation of each/either parent; education of each/either parent; number of children in the family; birth order; and instructional program. Grade 5 students were selected from schools in the general area of Edmonton, a large Western Canadian urban center.

Definition of Terms

The scope of each pertinent concept is described as it was used in this study.

Creativity

In that the Torrance Tests of Creative Thinking (TTCT) were chosen as the testing instruments, the term "creativity" was considered mainly as he defined it. Torrance (1974a:8) stated that creativity is:

> A process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about the deficiencies; testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results.

This operational definition appeared to be appropriate for the aspects of the creative process examined in this study.

Gifted

The term "gifted" has both the general definition and the specific dimension as used in identifying individuals for a special program. The initial focus in the Edmonton Public Schools was on the academic aspect of giftedness but this is being expanded.

The general definition used is that established by the Alberta Department of Education in 1983 (1986:1-3). It is as follows:

> Gifted and talented pupils are those who by virtue of outstanding abilities are capable of exceptional performance. These are children who require differentiated provisions and/or programs beyond the regular school program to realize their contribution to self and society.
>
> Children capable of exceptional performance include those with demonstrated achievement and/or potential ability in one or several areas:
>
> a. general intellectual ability,
> b. specific academic aptitude,
> c. creative or productive thinking,
> d. visual and performing arts

Two other areas have since been added to this definition, "leadership ability" and "psychomotor ability" (1986:1-3).

In this study, "Gifted" refers to those students identified for and in Gifted programs and hence, the term "Identified Gifted (IG)" is used. The students were enrolled in three different school systems, each with somewhat different identification criteria. The three sytems identify the candidate by using a combination of IQ, achievement, and teacher rating, varying in minimum scores and in ratio for each system; one system includes a parent rating.

In the Edmonton Public School System, the candidates are scored on a matrix, with a minimum total being necessary to qualify for special programming. The factors considered, with weightings of 2:2:1 respectively, are IQ scores; achievement scores for reading, mathematics, and visual skills, as measured on the Canadian Tests of Basic Skills; and ratings by the teacher(s).

In the Edmonton Catholic School System, the students for special enrichment programs are chosen on the basis of teacher and parent nomination, with some consideration being given to intellectual ability and basic academic skills. No matrix is used and the program teacher conducts an interview with the prospective students, singly or as a group.

The students for special enrichment programs in St. Albert Catholic School District are selected on the basis of IQ, standardized tests, teacher rating, and parent rating. The weightings of each are about equal. The IQ minimum is around 125 and the standardized test minima are based on approximately the top 5% on the Canadian Tests of Basic Skills.

Intelligence

Intelligence as Used in this Study

The term "intelligence" is that used by Wechsler (1974, p. 5). It is "the overall capacity of an individual to understand and cope with the world around him." Intelligence is considered as an overall or global entity; "that is, a multidetermined and multifaceted entity rather than an independent, uniquely defined trait." This definition "avoids equating general intelligence with intellectual ability."

Two aspects of intelligence were considered in this study, the Verbal and the Nonverbal or Performance IQs. In the Verbal IQ measure, the "ability to understand and use words plays a crucial role in determining performance" (Sattler, 1982:646). The Nonverbal measure consists of "nonverbal and nonlanguage materials for which spoken or written language is not required" (Sattler, 1982:640). With respect to the Performance IQ test, the items "do not involve the use of language, either oral or visual, except for the interpretation and following of directions. Even directions may be given without words if necessary" (Sattler, 1982:641).

IQ Tests

Mainly the Canadian Cognitive Abilities Test (CCAT) and the Lorge Thorndike (LT) scores were used. These tests were considered to be sufficiently equivalent, especially with Thorndike as author in common. The editions used were the 1974 CCAT and the 1967 LT. These are group tests, administered routinely in the Edmonton area, the CCAT in Grade 3 in the Edmonton Public System, the LT in Grade 4 in the Edmonton Catholic and the St. Albert Catholic Systems. In two cases, the individual Wechsler Intelligence Scale for Children - Revised (WISC-R) results, the only IQ scores available for those students, were used, one from Grade 2 and one from Grade 4. Since the standard deviations of the CCAT and LT are 16, and that of the WISC-R is 15, the WISC-R scores were converted to a standard deviation of 16. The scores used were for the Verbal and Nonverbal subtests, with the Performance score of the WISC-R being equated with the Nonverbal. In calculating the mean IQ in identifying the sample, however, the Quantitative CCAT score was included.

Higher Ability

This is a term related to intelligence that is used in this study in reference to an IQ rating. For the CCAT and LT scores, an average was calculated for the Verbal and Nonverbal IQ score of each subject, with the minimum average qualifying for the study being 109; for the WISC-R, the Full Scale score was used, with the same minimum applying. The WISC-R manual classifies an IQ of 110 - 119 as "high average" (1974:26), and, hence, the term "higher ability" was deemed appropriate for describing the subjects in this study.

Achievement

"Achievement" was considered in terms of the teacher-given subject area grades for the end of the preceding year, i.e. for Grade 4. The teacher-given grades were the only achievement scores available for all students in the sample.

Subject Area Grades

These reflect the student's actual performance in subject areas for Grade 4. The academic subjects examined were Language Arts, Mathematics, and Social Studies, with a mean being calculated for these. The other marks used were for Art, Music, and Physical Education. Science was not reported in a number of cases and was excluded. In that mainly letter grades are customary in elementary, with some marks "Excellent" (E) or "Satisfactory" (S), these were all converted to those generally accepted as having approximate equivalence, with 80-100% or A or E as 1; 65-79% or B or S as 2; 50-64% or C as 3; and below 50% or D as 4.

Gender

Gender refers to being male or female and was equated with "sex" as used in the other research studies being reviewed.

Age

The age of the child as used in this study was as of May 31, 1986. It was written in decimal form. For example, age 10 years 8 months was written 10.67.

Family Circumstances

These include some of the family's status and human factors that might affect the individual child. Under consideration were the family structure, the occupational status and educational background of each of the father and the mother, the number of children in the family, and the birth order of the child under study.

Family Structure

This can vary widely, especially in our Western world. The main categories were the traditional two-parent, the lone-parent, the combined family (two opposite-sex parents, possibly with children from previous relationships), and the guardianship situations. Any adoptions among the selected students were noted from the individual cumulative records.

Occupational Status

The occupations of each parent were ranked by the researcher according to the revised Pineo-Porter-McRoberts Socioeconomic Classification of Occupations for the 1981 Census (Pineo, 1985:13-14) (see

Appendix E for the categories).

For statistical meaningfulness, some groupings of classifications were made. Levels were combined for tabulating, for example, as shown in Table 3.4. The revised Pineo-Porter McRoberts categories of occupation were grouped as follows: Level 1-2: self-employed and employed professionals (professional); Level 3-4: high level management and semi-professionals (semi-professional); Level 5-8: technicians, middle management, supervisors, and foremen and women (technical/middle management); Level 9-10: skilled clerical sales and service, skilled crafts and trades, and farmers (skilled clerical; sales/crafts); Level 11-14: semi-skilled clerical sales and service, semi-skilled manual and unskilled clerical sales and service (semi-skilled); and Level 15-16: unskilled manual and farm laborers (unskilled manual). Two additional categories were noted in this study to accommodate those who did not appear to fit the levels based on income, the category of "others" including the part-time casual workers, students, and unemployed, and the category of "homemakers."

Educational Background

The highest educational level for each parent was recorded. The categories used were:

1. High school not completed
2. High school diploma
3. Technical/post high school diploma
4. University undergraduate degree
5. Master's/graduate studies
6. Ph.D. or equivalent

Birth Order

Birth order refers to the ordinal position of the subject with respect to the other children, if any, in the family.

Program

Regular and Identified Gifted

The program of instruction refers to the type of school organizational arrangement to accommodate the academic, social, and emotional needs of individual students. The children in the sample under study have been drawn from the heterogeneous regular (REG) classes and the more selective Identified Gifted (IG), with the latter being differentiated as either Pullout (PO) or Full-time (FT). Extra government funding per IG student has been available in Alberta each year since 1984, with a minimum score on the local system's identification matrix being necessary to qualify. Students may have to cross boundaries in order to get to a school that offers an IG program.

PO IG

A pullout program is "the placement of intellectually gifted students in a heterogeneous classroom for most of their instruction but removing them to form a homogeneous class for a small part of their instruction" (Belcastro, 1987:208). In the pullout program, students work in a special setting ideally to "interact with each other and work with specially trained teachers who use materials, methods, and activities designated for the gifted" (Belcastro, 1987:208). Students in pullout programs are to be offered broader and deeper educational experiences, with these usually in two or three one-hour periods per

week. The majority of schools in the Edmonton area which offer programs for the gifted use this arrangement.

FT IG

Identified gifted students in this program attend designated centers, available locally in only the Edmonton Public School System. These constitute full-time academic challenge classes within a regular school and often out of the students' own residential areas.

Research Components

Instruments: The TTCT

The TTCT were chosen as the testing instruments in that they seem to be the best known and they offer detailed information about the separate facets of the creativity of an individual. The format of the tests and instructions are clear, and the manuals include extensive descriptions of the rationale and the scoring procedures. The availability of a commercial scoring service reduced the possibility of subjectivity. From the point of view of a teacher of the Gifted, the tests appear to have good face validity. According to Amabile (1983:26, 22), creativity tests "were developed as tools for individual difference research," and "most tests for creativity are validated against the TTCT."

The two instruments used were the Figural and Verbal Torrance Tests of Creative Thinking (TTCT). Each of the alternate forms, A and B, are rated equivalent by their author, with each having verbal and figural sections. The manual provides careful instructions.

The categories of the TTCT are given in detail in Table 4.1. The Figural includes scoring for Fluency, Originality, Abstractness of Titles, Elaboration, and Closure, with an Average being given and with the Creativity Index encompassing the given subscores plus additional information from thirteen criterion-referenced subscores. The Verbal includes Fluency, Flexibility, and Originality, with an Average again being provided.

The tests attempt to sample as many different kinds of manifestations of creative thinking ability as possible, yet maintaining acceptable levels of reliability and validity (Torrance, 1974a:4).

In this study both batteries of Form A were given in their entirety. It was noted that "the author generally advises against the use of incomplete batteries" (1974a:48).

Norms for the TTCT

Norms for the TTCT Figural battery were obtained by using the streamlined scoring system. They were derived from the test responses of United States students (Torrance and Ball, 1984:53).

The norms for the TTCT Verbal battery were based on testing results in the United States. "The norm group is multi-racial and multi-ethnic and is intended to be representative of the mid-range of most school populations". (Torrance, 1974a:48).

Validity of the Verbal TTCT

The overall content validity is relatively low, although some parts are higher. For the Verbal TTCT, Torrance has made a consistent effort to base the tests on the best theory and research available (Torrance,

1974a:22). Tasks were deliberately chosen because "they call into play different parts of a universe of abilities that may legitimately be conceptualized as 'creative thinking abilities'" (Torrance, 1974a:21). The low intercorrelations between tasks have been criticized, by Wallach and Kogan, for example, but Torrance contends that these interrelationships are a consequence of the multi-faceted nature of creativity itself.

Studies of concurrent validity have included correlating creativity scores with measures of educational achievement (Torrance, 1974a:38-39). One such study by Torrance and Yamamoto found significant relationships at the .05 level as follows: Gates Reading Test .40, Iowa Reading Skills .48, Iowa Study Skills .37, Iowa Language Skills .38, and Iowa Arithmetic Skills .28. These were calculated with the effects of intelligence partialled out.

One subtest that has "a high degree of face validity" is the Verbal Product Improvement Activity. It reflects a desirable type of thinking that gives practical solutions to a realistic problem (Torrance, 1974a:12).

Validity of the Figural TTCT

The validity of the original (1974) four divergent production scores has been rated as "generally satisfactory" (Torrance and Ball, 1984:5), even after considering results of the newer scoring method. With streamlined scoring, the Figural Fluency, Originality, and Elaboration scores have correlated quite highly with the scores from the earlier method and, hence, have been assumed to be comparably valid. For the two new norm-referenced measures and the thirteen criterion-

referenced indicators, new studies have shown support for the content validity. Few predictive, concurrent, and construct validity studies had been reported at the time of the Torrance and Ball (1984) publication. Those that have been reported show that predictive validity, in particular, appears to be satisfactory for tests in the third, fourth, fifth, and sixth grades (Torrance and Ball, 1984:6-7).

Test-Retest Reliability of the Figural and Verbal TTCT Scores

Using both the Figural and Verbal TTCT, the test-retest reliability coefficients vary somewhat. In the Torrance Manual (1974a:20), the figures range from .59 to .85 for fluency, .35 to .69 for flexibility, and .57 to .83 for originality. It is noted that "motivational conditions affect test-retest reliability."

Reliability of the Figural TTCT Streamlined Scoring

Torrance and Ball (1984:4-5) report that studies have indicated that "it is possible to keep the scoring reliability of the norm-referenced and criterion-referenced measures above the .90 level." In a study comparing regular and streamlined scoring, the reliability coefficients were consistently in the .90s, with "no statistically significant differences in the means of the Fluency and Originality scores." However, the streamlined scoring tended to yield higher scores on Elaboration since that method uses an estimate rather than an actual count of details.

Sample

Selection Process

The sample for this study was drawn from higher-ability Grade 5 students. They were selected from among those qualifying within selected schools in terms of mean IQ $\geq$109. Sixty children were selected in the greater Edmonton area from three school systems, namely Edmonton Public, Edmonton Catholic, and St. Albert Catholic. Seven larger schools were chosen to approximately sample a representative range of socioeconomic subdivisions. For the expedience of testing, a minimum of five students was chosen from each school. An attempt was made to have an equal number of each gender in the total sample.

Mean IQs were calculated for the purpose of selection of the sample. The minimum mean required was 109. The means used were the averages of the individuals' scores for the VIQ, QIQ, and NVIQ of the Canadian Cognitive Abilitites Test, and the VIQ and NVIQ of the Lorge-Thorndike. The Full-Scale score was used for the WISC-R. As a matter of interest, no subjects would have been excluded had the CCAT Quantitative scores not been included in the means.

Description of the Sample

This section describes the sample, with elaboration provided for additional background. Some variables on which data were collected but which did not have sufficient variation to analyze are briefly discussed. The variables in the actual research are presented in greater detail. Information with respect to attendance and illness is presented first, followed by details about factors involved in the research questions.

The sample included one set of fraternal twins, and no adoptions were reported.

Attendance was rated mainly as satisfactory. One student had missed more than 20 days through illness but still had a B+ average, and two others averaged 15 days absent per school year and yet had A- and A+ averages. Only three subjects were absent for more than 20 days of schooling. This did not appear to cause a problem since the achievement was high.

In terms of illness, none of those reported were rated by a medical doctor as being sufficiently serious to affect their learning ability. Thirty percent reported common childhood diseases, allergies, or ear problems. One student was reported to have had scarlet fever.

Gender and Program

The distribution of the sample by gender and program is shown in Table 3.1. The ratio of girls to boys was 18:12 in the REG programs and 13:17 in the IG.

Students from two of the selected schools were from bilingual (English/French) classes, with some of these being in REG and some in PO IG programs.

As shown in Table 3.1, 50% of the subjects were in REG programs and 50% were in IG. Within the IG programs, 40% were in PO, 60% were in FT. Table 3.5 shows the distribution by age, gender, and program.

Table 3.1

Distribution of Sample by Gender and Program

Gender	Regular	Identified Gifted		Total
		Pullout	Full-time	
Girls	18	3	10	31
Boys	12	9	8	29
Total	30	12	18	60

Intelligence

Table 3.2 shows the frequency distribution of the IQ scores in the sample. The actual Verbal scores ranged from 97 to 150, with the Nonverbal from 100 to 147. The mean IQ column, used in the selection of the sample, consists of the mean of the CCAT VIQ, QIQ, and NVIQ; the mean of the LT VIQ and NVIQ; or the WISC-R FSIQ, according to the data available for each subject.

Table 3.3 shows the Verbal and Nonverbal IQ data for the whole group as well as by program and gender. The IQ frequency distribution has been given in Table 3.2. The IG students, who by definition would be expected to have higher IQ, were indeed found to have higher IQ scores.

Table 3.2

Frequency Distribution of IQ Scores of the Sample

	VIQ			NVIQ			Mean or FS IQ		
IQ Range	f	%	cum. %	f	%	cum. %	f	%	cum. %
90 - 99	2	3	3	0	0	0	0	0	0
100 - 109	4	7	10	10	17	17	1	2	2
110 - 119	18	30	40	22	36	53	26	43	45
120 - 129	18	30	70	10	17	70	17	28	73
130 - 139	14	23	93	10	17	87	14	23	97
140 - 149	3	5	98	8	13	100	2	3	100
150 - 159	1	2	100	0	0	100	0	0	100
N		60			60				
M		123.1			121.7				
Median		123.0			119.0				
SD		10.4			12.2				

Note. These scores consist of 39 CCAT and 19 LT, with M = 100, SD = 16, and 2 WISC-R, M = 100, and whose SD was converted from 15 to 16.

Table 3.3

Verbal and Nonverbal IQ Data by Program and Gender

	Verbal IQ			Nonverbal IQ		
Category	Girls	Boys	Group	Girls	Boys	Group
REG						
M	117.3	117.1	117.2	113.4	117.6	115.1
SD	6.2	12.4	9.0	8.3	8.1	8.3
n	18	12	30	18	12	30
IG						
M	130.8	127.6	129.0	130.9	126.1	128.2
SD	7.9	8.3	8.1	12.7	11.2	11.9
n	13	17	30	13	17	30
Total						
M	123.0	123.3	123.1	120.7	122.6	121.7
SD	--	--	10.4	--	--	12.2
n	31	29	60	31	29	60

T-Test results are given in Table 3.4, with program used as the means of grouping to compare intelligence levels. There was found to be a significant difference in IQ between the IG, the higher IQ group, and the REG, the relatively lower IQ group, for both verbal and nonverbal IQ.

Table 3.4

T-Test Results for Verbal and Nonverbal IQ for Two Program Levels

Program	n	M	SD	T	df	p
			Verbal IQ			
REG	30	117.2	9.00			
IG	30	129.0	8.14	-5.32	58	.00**
			Nonverbal IQ			
REG	30	115.1	8.32			
IG	30	128.2	11.94	-4.93	58	.00**

**$p \leq .05$, two-tailed

Age

The age frequency distribution and the mean age of the sample is given in Table 3.5. It is shown by gender and program as well. The range in age was from 9.17 to 11.50, with all except two students between 10.17 and 11.17 inclusive.

Table 3.5

Age Frequency Distribution and Mean Age of Sample by Gender and Program

				Identified Gifted					
		Regular		Pullout		Full-time		Total	
Age	f	G	B	G	B	G	B	G	B
9.17	1						1		1
9.25									
9.33									
9.42									
9.50									
9.58									
9.67									
9.75									
9.83									
9.92									
10.00									
10.08									
10.17	3	1				2		3	
10.25	2	2						2	
10.33	8	2	3			2	1	4	4
10.42	3			1		1	1	2	1
10.50	6	2	2		2			2	4
10.58	9	3	2		1		3	3	6
10.67	10	4	1	1	1	2	1	7	3
10.75	1					1		1	
10.83	5		3		1	1		1	4
10.92	1						1		
11.00	3	1		1		1		3	
11.08	3	2			1			2	1
11.17	4		1		3				4
11.25									
11.33									
11.42									
11.50	1	1						1	
Total	60	18	12	3	9	10	8	31	29
M	10.62	10.63	10.62	10.70	10.85	10.54	10.41	10.61	10.63
Range	2.33	1.33	0.84	0.58	0.67	0.83	1.75	1.33	2.00

Family Structure

The family structure of the students was not typical of their metropolitan area or province. Out of the 60 studied, there were only 4 lone parents, all female, and there was 1 combined family. The ratios are atypical as shown in Table 3.6. There were no guardianship situations and none of the sample students were reported as adopted.

Table 3.6

Ratios of Family Structure of the Students Compared to Statistics for Area[a]

Group	Married Couple to Lone Parent	Lone Parent Female to Male	Combined Family to Total
Study	13.8:1	4:0	1:60
Metropolitan Area	6.6:1	4.7:1	NA[b]
Province	7.5:1	5.2:1	NA[b]

[a]1986 Canada Census data from Statistics Canada.

[b]NA = Not available.

Occupational Level of Parents

The occupational levels have been depicted in percentage distributions. Table 3.7 shows this for the mother's occupation, broken down by gender and program. Similarly, Table 3.8 gives the distribution for the father's occupation. The levels of occupations in each table were grouped for statistical meaningfulness.

Table 3.7

Distribution of Mother's Occupational Level by Gender and Program

Level	Girls		Boys	
	REG (%)	IG (%)	REG (%)	IG (%)
1 - 2	0	30.8	8.3	29.4
3 - 4	16.7	7.7	16.7	17.7
5 - 8	5.6	7.7	8.3	5.9
9 - 10	16.7	7.7	16.7	11.8
11 - 14	27.8	7.7	0	17.6
15 - 16	0	0	0	0
H[a]	27.8	23.1	33.3	11.8
Others[b]	5.6	15.4	16.7	5.9
n	18	13	12	17

Note. Levels of occupation are given in Appendix E.

[a]H = Homemaker
[b]Others = part-time workers, students and unemployed.

There were distinct differences between the program groups in percentages of mothers at specified occupational levels (Table 3.7). About 30 percent of the mothers of both IG girls and boys were in the top two levels. The largest percentage of homemakers was the group of mothers of REG boys, whereas the smallest group of homemaker mothers was for IG boys.

Table 3.8

Distribution of Father's Occupational Level by Gender and Program

Level	Girls		Boys	
	REG (%)	IG (%)	REG (%)	IG (%)
1 - 2	16.7	53.9	18.2	37.6
3 - 4	5.6	38.5	9.1	25.1
5 - 8	27.9	7.7	36.4	25.1
9 - 10	22.3	0	36.4	12.6
11 - 14	16.7	0	0	0
Others[a]	11.2	0	0	0

Note. Levels of occupations are given in Appendix E. Levels were grouped for statistical meaningfulness.

[a]Others = Part-time casual workers, students and unemployed

Differences are noted within Table 3.8. The fathers of the IG students held higher level jobs than did the fathers of the REG students, particularly for the girls. About 92% of the fathers of the IG girls were in Levels 1-4, whereas about 63% of the fathers of the IG boys were in these levels.

The parents in this study are atypical for the average working situation in this urban area in June, 1986. At a time when the unemployment rate in Edmonton was 12.6% (Statistics Canada), only one father (1.7%) and no mothers reported being unemployed. (In the case of the unemployed father the mother worked at a Level 9 job.) This study

found that 93% of the fathers and 67% of the mothers were employed full time. Of the other mothers, 23% were "homemakers," and no fathers reported being "househusbands." Three mothers and one father were full-time students. Of the four "lone parents," all female, one was a homemaker, with the other three holding jobs at Levels 2, 9, and 12 respectively.

Educational Level of Parents

Table 3.9 shows the six selected levels of education for the parents. The parents who had attained technical and other post high school non-university diplomas are grouped together. The fathers' overall mean level of education is somewhat higher than that of the mothers.

The educational level of parents of this study sample is considerably higher than the level for the adults in the Edmonton area. The 1986 census data (Statistics Canada) for the Edmonton area show that of the people $\geq$ 15 years of age there are 10.5% of the females and 13.3% of the males who have university degrees (see Appendix F). In this study, 31.6% of the mothers and 50.1% of the fathers have university degrees. Although the census data refers to "adults" and this study deals with only the "parents" within the larger group, the data has been presented for comparative information.

Table 3.9

Educational Levels for Parents of Subjects

Level	Mother		Father	
	f	%	f	%
High school not completed	9	15.0	9	15.5
High school diploma	25	41.7	14	24.1
Technical/post high school diploma	7	11.7	6	10.3
University undergraduate degree	12	20.0	11	19.0
Master's/post-graduate	5	8.3	11	19.0
Ph.D. or equivalent	2	3.3	7	12.1
n	60		58[a]	

Note. Because of the high-ability nature of the sample, the levels were broken down differently from those in Canada Census data (see Appendix F).

[a]The fathers of two children were not reported.

Table 3.10 outlines the differences between the educational levels of each of the children's parents, with the technical/diploma and university undergraduate degree levels combined. In 50.0% of the cases the father had a higher level of education than the mother. Mothers exceeded fathers in 17.2% of the cases and equalled the father's level in 32.8%. For the two mothers who did not report their children's father, one was at the lowest level of education and one was a university graduate. Within the IG group, 63.3% of the fathers had one or more levels of education beyond that of the mothers.

Table 3.10

Frequency of Differences in Educational Levels of Parents

	No. of Levels of Difference							
	Father > Mother			F = M	Mother > Father			
	3	2	1	0	1	2	3	Total[a]
f	1	5	23	19	9	1	0	58
%	1.7	8.6	39.7	32.8	15.5	1.7	0	100

Note. The five educational levels used were: High school not completed; high school diploma; university undergraduate degree or post-high school diploma; Master's; and Ph.D. or equivalent.

[a]The total was 58 in that 2 fathers were not reported.

Number of Children in the Family

The distribution of this variable is shown in Table 3.11. Girls in REG programs came from the larger families, with a mean of 3.17 children. The mean for the sample was 2.53.

Within the IG group, 69% of the girls and 59% of the boys were from two-child families, and only 8% of the girls and 18% of the boys were "only children."

Table 3.11

Frequency Distribution and Means of Number of Children in the Family by Program and Gender

	Regular		Identified Gifted		
No.	Girls	Boys	Girls	Boys	Total
1	0	2	1	3	6
2	8	6	9	10	33
3	4	3	2	1	10
4	4	1	0	3	8
5	1	0	1	0	2
6	0	0	0	0	0
7	0	0	0	0	0
8	1	0	0	0	1
M	3.2	2.3	2.3	2.2	2.5
SD	1.5	0.9	0.9	1.0	
n	18	12	13	17	60

Birth Order

A number of differences were in evidence as shown in Table 3.12. First-borns numbered 45% of the sample, including the 10% who were in the "only child" category. The last-borns (not including "only children") constituted 42% of the sample, with the remaining 13% being "in-betweens." Within the IG group, 46% of the girls and 53% of the boys were first born (including "only children" in both cases), whereas

54% of the girls and 35% of the boys were last born (not including "only children" in either case).

Table 3.12

Birth Order Data by Program and Gender

	REG				IG				
	Girls		Boys		Girls		Boys		Total
Birth Order	f	%	f	%	f	%	f	%	f %
One-child families	0	(0%)	2	(17%)	1	(8%)	3	(18%)	6 (10%)
First-born[a]	7	(39%)	3	(25%)	5	(38%)	6	(35%)	21 (35%)
Last-born[b]	7	(39%)	5	(42%)	7	(54%)	6	(35%)	25 (42%)
"In-between"	4	(22%)	2	(17%)	0	(0%)	2	(12%)	8 (13%)
n	18		12		13		17		60

[a,b]These frequencies do not include "only children".

Research Procedures

Data Collection

Data were gathered in a series of steps. Permission letters for those selected from a target class in the consenting schools were prepared by the researcher (see Appendix A). Through the cooperation of the classroom teacher, these were sent out to and collected back from the parents/guardians of those students.

Information about the individual students was obtained from both the parents' information forms and the schools' cumulative record

folders. On the arranged day of the TTCT testing, the data were collected by the researcher/test administrator. A master sheet of information was compiled for each child in the study (see Appendix D).

Testing Procedure

The TTCT were administered to groups of students in their home schools. The number in each group was ten or fewer. A total time block of at least two hours, morning or afternoon was requested, without interruption and in a separate, quiet space. The space was organized in advance, with a form prepared to record the timing (see Appendix B). A prepared warm-up procedure was followed in each school to create a consistently comfortable atmosphere for the session, and appropriate time breaks were provided (see Appendix C). The tests were administered by the researcher, an experienced teacher, with the Figural test being given first.

Test Marking

The TTCT booklets were professionally marked. These were sent to Scholastic Testing Service, with the marked tests being returned, complete with computer analyses.

Statistical Analyses

All the data were processed through the use of the SSPS-X statistical package. The relevant raw data is presented in Appendix G.

Pearson correlations were made between each variable under study and each subtest score of the TTCT, with significant findings being noted.

T-tests were run to compare groups within some selected variables in terms of their TTCT mean scores to determine if significant differences did exist. The t-tests used in this study were to compare TTCT creativity mean scores for two levels of achievement and for the two main programs.

One-way ANOVA was run to find whether there were significant systematic differences between the TTCT mean scores for subgroups of selected variables. The variables used in this analysis of variance were gender, age, occupation of each parent, education of each parent, number of children in the family, and birth order.

Duncan procedures were added to the ANOVA to ascertain if significant differences could be found among the subgroups of certain variables. These were applied in comparing TTCT means with the occupation of each parent.

The variable not tested by t-tests or ANOVA was that in which there were not sufficient numbers in one of the subgroups. This applied to family structure.

Multiple regression analyses were made to determine the relative effects of selected variables on a creativity score. TTCT Figural Average, Creativity Index, and Verbal Average were used as the representative predicted creativity scores and the independent variables considered were verbal and nonverbal IQ, age, gender, occupation of each parent, education of each parent, number of children in the family, birth order, and program.

Summary

This chapter outlined the components of the research, procedures followed, and details of the sample. Terms were defined as used in the study. The norms, validity, and reliabilty of the Torrance Tests of Creative Thinking were discussed. The sample was described with respect to gender, age, family structure, occupation of parents, education of parents, number of children in the family, birth order, and program. Research procedures involved the data collection, administration of the tests, arrangements for test marking, and the statistical analyses.

> Creative people discern previously unseen patterns; they see in new ways. They also make connections where no connections had seemed possible. They take risks; seize upon chance; form networks of people who interact in creative ways. What all this seems to come to is the curious mind, the fresh eye, the receptive heart, and the unafraid personality.
>
> Robert Shankland
> In S. Butterfield (Ed.), The Faces and Forms of Creativity

CHAPTER IV

RESULTS OF THE RESEARCH

This chapter presents and discusses the results of the research. The content is a combination of tabular and written analyses. The first section presents the hypotheses to be tested. The second section contains the results of the creativity testing. In the third section the hypotheses are tested, with correlational and ANOVA/T-Test information being given, along with Duncan procedure results where applicable. The final section consists of the multiple regression results.

Hypotheses

1. There is no signficiant relationship between creativity and intelligence.
2. There is no significant relationship between creativity and academic achievement.
3. There is no significant relationship between creativity and gender.
4. There is no significant relationship between creativity and age.

5. There is no significant relationship between creativity and:
   - 5.1 The family structure.
   - 5.2 The socioeconomic status of the family, as determined by the occupation of each/either parent.
   - 5.3 The educational background of each/either parent.
   - 5.4 The number of children in the family.
   - 5.5 The birth order of the child.
6. There is no relationship between creativity and instructional program.

Creativity Test Results

The TTCT results are given in Table 4.1. The means, medians, standard deviations, and percentiles are shown. The given abbreviations for the TTCT subtitles are those used in subsequent tables. The scores shown in Table 4.1 are based on converted standard scores with a mean of 100.

In this study, the Verbal creativity scores were found to be higher overall than those for the Figural. Verbal Flexibility was the highest of all the subtests, with this at the 76%ile for the U.S. norms. Figural Fluency, at the 21 %ile, was the lowest.

Table 4.1

Means, Medians, Standard Deviations, and Percentiles of TTCT Figural and Verbal Creativity Scores

Category	M	Median	SD	%ile
Figural				
Fluency (Flu)	83.4	82.5	14.4	21
Originality (Or)	90.7	93.0	14.8	33
Titles (Ti)	108.7	107.5	15.0	67
Elaboration (El)	90.4	90.0	7.4	31
Closure (Cl)	96.9	96.0	15.8	42
Average (Av)	94.0	94.5	10.3	38
Creativity Index (CI)	103.1	105.0	11.2	56
Verbal				
Fluency (Flu)	105.6	104.0	17.4	62
Flexibility (Fle)	114.2	116.0	16.7	76
Originality (Or)	93.8	91.0	14.1	38
Average (Av)	104.5	104.5	14.1	60

Note. N = 60. Scores are based on U.S.A. norms, using a mean of 100.

The frequency distribution of scores by interval is found in Tables 4.2 and 4.3 for the Figural and Verbal TTCT respectively. The means and medians are recorded in Table 4.1.

Table 4.2

Frequency Distribution of TTCT Figural Creativity Scores by Interval

Range	Flu	Or	Ti	El	Cl	Av	CI
60 - 69	10	4	0	0	2	0	0
70 - 79	16	10	1	3	8	4	1
80 - 89	12	12	3	16	8	16	7
90 - 99	16	15	14	35	14	21	14
100 - 109	4	10	12	6	16	15	22
110 - 119	1	9	14	0	7	4	12
120 - 129	1	0	11	0	2	0	4
130 - 139	0	0	3	0	3	0	0
140 - 149	0	0	1	0	0	0	0
150 - 159	0	0	0	0	0	0	0
160 - 169	0	0	1	0	0	0	0

Note. N = 60. Scores are based on U.S.A. means, using a mean of 100.

Table 4.3

Frequency Distribution of TTCT Verbal Creativity Scores by Interval

Range	Flu	Fle	Or	Av
60 - 69	0	0	0	0
70 - 79	2	1	2	3
80 - 89	10	3	24	3
90 - 99	13	9	20	15
100 - 109	12	11	10	19
110 - 119	11	11	1	12
120 - 129	6	17	0	6
130 - 139	4	5	1	0
140 - 149	2	1	2	2
150 - 159	0	2	0	0

Note. N = 60. Scores are based on U.S.A. norms with a mean of 100.

Testing the Hypotheses

Pearson correlations were run with all variables in the study. The correlations and the probabilities have been tabulated for those variables relevant to the hypotheses.

Other statistical tests have been applied as well. ANOVAs, t-tests, and in some cases, where subgroup information was deemed desirable, the Duncan procedures have been used.

Creativity and Intelligence

Research Question No. 1

Is there a relationship between creativity and intelligence?

In answering this question, Pearson correlations were used for the entire group of 60 students. Each student's score on the Verbal and Nonverbal IQ scales was correlated with the subtest scores of the TTCT Figural and Verbal batteries.

In Table 4.4 the Pearson correlations of the creativity variables with Verbal and Nonverbal IQ scores are given. These were significant for only some Figural creativity areas and not for any Verbal creativity subscores. The significant relationships that existed between Verbal IQ and Figural creativity were in Titles, Resistance to Closure, Average, and Index. The only significant relationship between creativity and Nonverbal IQ was for Figural Titles.

Thus, Hypothesis No. 1, that there is no significant relationship between creativity and intelligence was wholly supported for Verbal creativity, and only partly for Figural creativity. Contrary to the hypothesis, a relationship was found between Figural Titles and IQ, both verbal and non-verbal.

Creativity and Achievement

Research Question No. 2

Is there is a relationship between creativity and academic achievement?

A number of steps are necessary in order to determine if a relationship does exist between creativity and achievement, as a whole and/or in part. The mean grades and frequencies for each subject area

Table 4.4

Pearson Correlations of TTCT Creativity Scores with Verbal and Nonverbal IQ

	VIQ		NVIQ	
Category	r	p	r	p
Figural				
Flu	.02	.43	.12	.19
Or	.07	.31	.02	.45
Ti	.29	.01*	.29	.01*
El	.12	.18	.03	.41
Cl	.28	.01*	.13	.17
Av	.22	.05*	.09	.24
CI	.24	.03*	.17	.10
Verbal				
Flu	-.02	.45	-.10	.22
Fle	.17	.10	.13	.15
Or	-.01	.47	.01	.47
Av	.06	.33	.02	.45
N	60		60	

*$p \leq .05$

are examined first. Correlations are presented per subject area and t-test results are used to explore differences between achievement groups.

Table 4.5 includes the frequency of grades, the means, and the standard deviations for each subject area. The coding used for grades appears with the table, with a mean of 1.6, for example, equalling about 71%. Over 93% of the grades were at the two higher levels, the As and Bs, or from 100 to 65%, with the numbers in each of these levels being approximately equal. The overall mean was 1.6.

For the Pearson correlations in Tables 4.6 and 4.7, a change has been made. To simplify interpretation, the positive and negative signs of the correlations have been reversed in the tables so that higher numbered achievement levels correlate positively with higher TTCT mean scores.

Table 4.6 shows the Pearson correlations between creativity and achievement in Language Arts, Mathematics, and Social Studies for the entire sample of 60 students. Of the 33 correlations run only three were significant at the .05 level. Both Language Arts and Mathematics correlated significantly with Figural Titles. Mathematics was found to have a significant negative correlation with Verbal Originality.

In Table 4.7 the Pearson correlations are shown for Art, Music, and Physical Education. Of the 33 correlations run, only four were significant at the .05 level. All four Verbal creativity subscores correlated significantly with Art. There were no significant correlation with either Music or Physical Education.

Table 4.5

Frequencies, Means, and Standard Deviations of Subject Area Grades

Category	Grade 1	2	3	4	M[a]	SD
Subject						
Language Arts	28	27	5	-	1.6	.64
Mathematics	39	18	2	1	1.4	.65
Social Studies	33	22	5	-	1.5	.65
Art	26	32	2	-	1.6	.56
Music	16	39	5	-	1.8	.57
Physical Education	29	28	3	-	1.6	.59
Percentage	47.5	46.1	6.1	0.3		

Note. The coding used for grades was ≥ 80%/A/E=1, 65-79%/B/S=2. 50-64%/C=3, and < 50%/D=4.

[a] N = 60

T-tests examined the possibility of any significant differences between the creativity scores of the two achievement groupings in each of the subject areas. Only the three main TTCT scores are reported, namely Figural Average, Creativity Index, and Verbal Average. The two main grade groupings were Level 1, the higher, and Levels 2 to 4 combined, with this being done for statistical purposes.

Table 4.8 shows the t-test results. The only significant finding was for Verbal Average and Art, with the students who had higher achievement grades showing higher scores in Verbal creativity. The t-test results are thus consistent with the correlational data.

In summary, on the whole, very few significant relationships were found between creativity and achievement. There was a significant positive correlation only between Figural Titles and both Language Arts and Mathematics, and between all Verbal subscores and Art, as well as a negative correlation between Mathematics and Verbal Originality. Students who had higher grades in Art had significantly higher Verbal creativity scores than students with lower grades in Art.

Hence, Hypothesis No. 2, that there is no significant relationship between creativity and achievement, is, on the whole accepted. Contrary to the hypothesis, however, there appears to be a significant relationship between the Verbal aspect of creativity and Art as well as between Figural Titles and both Art and Mathematics.

Creativity and Gender

Research Question No. 3

Is there a relationship between creativity and gender?

Table 4.6

Pearson Correlations Between TTCT Creativity Scores and Achievement in Language Arts, Mathematics, and Social Studies

	Subject					
	Language Arts		Mathematics		Social Studies	
Category	r	p	r	p	r	p
Figural						
Flu	-.15	.12	-.01	.48	-.12	.18
Or	-.04	.38	-.08	.29	.04	.39
Ti	.30	.01*	.21	.05*	.05	.37
El	-.08	.28	.12	.18	-.10	.22
Cl	.05	.36	.13	.17	-.05	.36
Av	.04	.37	.10	.23	-.04	.39
Cl	.07	.30	-.16	.11	-.03	.42
Verbal						
Flu	-.07	.31	-.12	.18	.04	.39
Fle	.21	.06	-.02	.43	.15	.13
Or	.06	.31	-.21	.05*	.08	.26
Av	.08	.28	-.13	.16	.10	.22
N	60		60		60	

*$p \leq .05$

Table 4.7

Pearson Correlations Between TTCT Creativity Scores and Achievement in Art, Music, and Physical Education

	Subject					
	Art		Music		Physical Education	
Category	r	p	r	p	r	p
Figural						
Flu	-.07	.31	.05	.36	-.09	.24
Or	.16	.11	.19	.08	-.15	.13
Ti	.06	.32	.19	.08	-.20	.06
El	.01	.47	-.09	.25	-.02	.45
Cl	.08	.28	.20	.06	-.19	.07
Av	.07	.29	.14	.15	-.11	.21
CI	.09	.25	.15	.13	-.15	.12
Verbal						
Flu	.25	.03*	.12	.19	.00	.49
Fle	.22	.04*	.16	.12	-.06	.33
Or	.25	.03*	-.06	.31	.12	.18
Av	.28	.02*	.08	.26	.02	.45
N	60		60		60	

*$p \leq .05$

Table 4.8

T-Test Results for TTCT Figural Average (FAV), Creativity Index (CI), and Verbal Average (VAV) Creativity Means by Achievement Level

Category	Language Arts	Math.	Social Studies	Art	Music	Physical Education
n(Grp. 1/2)	28/32	39/21	33/27	26/34	16/44	29/31
FAV						
M - Grp. 1	94.8	95.2	93.7	94.9	93.6	93.3
- Grp. 2	93.3	91.8	94.4	93.3	94.2	94.6
T	0.57	1.24	-0.25	0.60	-0.20	-0.50
p	.57	.22	.80	.55	.85	.62
CI						
M - Grp. 1	104.5	105.0	103.0	104.1	102.9	101.7
- Grp. 2	101.8	99.5	103.2	102.3	103.1	104.4
T	0.93	1.84	-0.07	0.61	-0.08	-0.92
p	.36	.07	.94	.54	.94	.36
VAV						
M - Grp. 1	105.2	104.4	105.5	108.7	104.1	105.3
- Grp. 2	103.9	104.8	103.3	101.3	104.7	103.8
T	0.35	-0.11	0.59	2.07	-0.15	0.43
p	.73	.91	.56	.04*	.88	.67

*$P \leq .05$, using pooled variance estimate.

Both the Pearson correlations and ANOVA values were used in this analysis. The Pearson results show no significant correlations between creativity and gender. Table 4.9 gives the mean TTCT creativity scores and ANOVA values by gender. The means appear to be comparable for each creativity category, with the possible exception of Verbal Flexibility, wherein the girls had a somewhat higher mean score. The ANOVA results, however, show no significant differences between the scores for the genders.

In summary, no significant relationship was found between creativity and gender. Thus, Hypothesis No. 3, that there is no significant relationship between creativity and gender, was supported.

Creativity and Age

Research Question No. 4

Is there a relationship between creativity and age?

To answer this question, the results of Pearson correlations, ANOVA, and Duncan procedures are examined. For the Duncan procedures, the students' scores were placed in four groupings for statistical purposes with these being labeled from 1 to 4. Group 1, the youngest, was from 9.17 to 10.33, Group 2 from 10.42 to 10.58, Group 3 from 10.67 to 10.87, and Group 4, the oldest, from 10.92 to 11.50. It is to be noted that in the youngest group only one child was of age 9.17, with the remainder ranging from 10.17 to 10.33 (see Table 3.5).

Table 4.10 shows the Pearson correlations between TTCT creativity scores and age of the students, with a gender breakdown also being reported. For the total group, significant correlations were found between age and only the Verbal creativity subscores, not the Figural.

Table 4.9

Mean TTCT Creativity Scores and One-Way ANOVA Values by Gender

Category	Girls	Boys	F^a	p
Figural				
Flu	85.0	81.6	0.84	.36
Or	91.9	89.3	0.44	.51
Ti	108.5	108.8	0.00	.95
El	89.8	91.0	0.41	.53
Cl	97.7	96.0	0.17	.69
Av	94.6	93.3	0.22	.64
CI	103.4	102.8	0.04	.84
Verbal				
Flu	105.5	105.7	0.00	.96
Fle	117.2	111.1	2.02	.16
Or	93.0	94.6	0.20	.65
Av	105.2	103.9	0.13	.73
n	31	29		

[a] df=1

*$p \leq .05$

Verbal Fluency, Originality, and Average were the scores significantly related to age, whereas Verbal Flexibility was not.

In the creativity/age by gender Pearson correlation, the boys accounted for most of the significant relationships, with the girls showing only one. All the Verbal creativity boys' scores were significantly correlated with age, including Verbal Flexibility. The girls' scores showed one significant correlation: Figural Fluency. Hence, the boys were mainly responsible for the correlation that was found to exist between creativity and age in this sample.

Table 4.11 gives the one-way ANOVA values plus the significant differences in mean creativity between/among the age groupings. For the latter, obtained through the Duncan procedure, the only means recorded are those with significant differences.

The ANOVA results showed significant differences mainly for Verbal creativity. The Verbal Fluency, Originality, and Average scores were significantly higher for the older children. There was a similar relationship for Figural Originality as well.

The Duncan procedures, the results of which are shown in Table 4.11, also determined that some older groupings had significantly higher creativity scores. Specifically, the significant differences among the groups, by age group numbers, were: 3 > 1 in Figural Originality; 4 and 3 > 1 in both Verbal Fluency and Flexibility; 4 > 1, 2, and 3 in Verbal Originality; and 4 > 1 for the Verbal Average.

Table 4.10

Pearson Correlations Between TTCT Creativity Scores and Age by Gender

	Girls		Boys		Total	
Category	r	p	r	p	r	p
Figural						
Flu	.30	.05*	-.07	.35	.07	.29
Or	.18	.17	.05	.40	.10	.23
Ti	.29	.06	-.20	.15	.01	.46
El	-.27	.07	-.07	.35	-.16	.11
Cl	.12	.25	-.03	.44	.04	.39
Av	.23	.11	-.08	.33	.04	.37
Cl	.21	.13	-.04	.41	.06	.32
Verbal						
Flu	.09	.31	.56	.00*	.38	.00*
Fle	.08	.34	.31	.05*	.18	.08
Or	-.05	.39	.49	.00*	.32	.01*
Av	.06	.38	.52	.00*	.33	.01*
n		31		29		60

* $p \leq .05$

Table 4.11

One-Way ANOVA Values for all TTCT Creativity Scores, and Mean TTCT Creativity Scores that Showed Significant Differences Between Age Groupings, Using Duncan Procedures

			Age Group			
			1	2	3	4
Category	F[a]	P	9.17 to 10.33	10.42 to 10.58	10.67 to 10.83	10.92 to 11.50
Figural						
Flu	.41	.75				
Or	2.71	.05*	82.4		97.0	
Ti	.83	.48				
El	1.29	.28				
Cl	.80	.50				
Av	1.16	.33				
CI	1.05	.38				
Verbal						
Flu	4.13	.01*	94.9		108.6	116.6
Fle	2.28	.09	105.3		117.9	120.4
Or	3.46	.02*	87.9	92.3	92.8	104.2
Av	3.89	.01*	96.2			113.2
n			14	18	16	12

Note. The only mean scores reported are those that showed significant differences in One-Way ANOVA and the Duncan procedures.

[a]df = 3 between groups, df = 56 within groups.

*$p \leq .05$

In summary, older children tended to score significantly higher on Verbal creativity subtests, but not on Figural subtests. It was found, however, that there was a gender difference in Verbal creativity scores, with the boys scoring significantly higher than the girls. Hence, Hypothesis No. 4, that there is no significant relationship between creativity and age, is rejected for Verbal creativity but, with one exception, accepted for Figural creativity.

Creativity and Family Circumstances

The relationships investigated in this area are between creativity and family structure, occupational status of the parents, education of the parents, number of children in the family, and birth order.

Creativity and Family Structure

Research Question No. 5.1. Is there a relationship between creativity and family structure?

The data were so one-sided that analyses could not be done. Discussion has been given along with Table 3.6, with 93% of the subjects reported to be living in two-parent families.

Creativity and Occupational Status of the Parents.

Research Question No. 5.2. Is there a relationship between the creativity of the child and the socio-economic status of the family, as determined by the occupation of each/either parent?

This question is investigated by results of correlations, ANOVA, and the Duncan procedures. The data, classified in the Pineo-Porter-McRoberts system (see Appendix E), with "homemaker" and "other" added, were grouped to give the descriptors shown in the tables for this

section. These groupings were used for both the Pearson correlations, ANOVA, and the Duncan procedures. The actual distributions by levels for each parent have been given in Tables 3.7 and 3.8, along with demographic details.

Tables 4.12 and 4.13 present the three main TTCT means for each occupational grouping of the mother and father respectively. The majority of the mean scores for the Figural Average, Creativity Index, and Verbal Average were comparable per occupational grouping of either parent. One possible difference could be for the scores of children of a semi-skilled parent, with the mean Figural creativity score being higher for children of mothers than for fathers in semi-skilled work.

The Pearson correlations were run but only two significant relationships were found between creativity and occupation of either parent. This was between the occupation of the father and Verbal Flexibility ($p = .01$) and Verbal Average ($p = .05$). None were found related to the mother's occupation.

One-Way ANOVA results, shown in table 4.14, showed no significant relationship between creativity and occupation of the mother, but there was one for the occupation of the father. Verbal Originality was significantly related to the occupation of the father ($p \leq .05$).

Using the Duncan procedures, it was found that a few occupational subgroups were significantly higher than others. This occurred only for the occupations of fathers and only with respect to Verbal creativity. Children of fathers in technical/middle management (Levels 5-8) achieved higher in Verbal Fluency, Originality, and Average than did children of professional fathers (Levels 1,2). This same group (Level 5-8 fathers)

Table 4.12

Mean TTCT Figural Average, Creativity Index, and Verbal Creativity Scores for Each Occupational Grouping for the Mother

Category[a]	n	F AV	CI	V AV
Professional (1,2)	10	96.7	106.7	99.6
Semi-professional (3,4)	9	92.8	102.1	102.4
Technical/Middle management (5-8)	4	100.0	108.5	107.3
Skilled clerical: Sales/Crafts (9-11)	8	93.8	102.8	103.9
Semi-Skilled (12-14)	9	93.4	102.3	111.9
Unskilled manual (15-16)	0	--	--	--
Homemaker	14	93.9	102.4	106.6
Other[b]	6	88.8	97.8	99.0
Grand total	60	94.0	103.1	104.5

[a]See Appendix E for details of the Pineo-Porter-McRoberts occupational levels. Note that the two categories of "homemaker" and "other" have been added.

[b]This includes part-time, student, and unemployed categories.

Table 4.13

Mean TTCT Figural Average, Creativity Index, and Verbal Creativity Scores for Each Occupational Grouping for the Father

Category[a]	n	F AV	CI	V AV
Professional (1,2)	18	96.6	105.6	101.8
Semi-professional (3,4)	11	93.5	102.6	104.3
Technical/Middle management (5-8)	14	94.9	104.9	113.2
Skilled clerical: Sales/Crafts (9-11)	10	91.1	98.9	100.6
Semi-Skilled (12-14)	3	83.0	91.0	112.0
Unskilled manual (15-16)	0	--	--	--
Homemaker	0	--	--	--
Other[b]	2	97.5	108.0	93.0
Grand Total	58[c]	94.0	103.0	105.0

[a]See Appendix E for details of Pineo-Porter-McRoberts occupational levels. Note that the two categories of "homemaker" and "other" have been added.

[b]This includes part-time, student, and unemployed categories.

[c]Two fathers were not reported.

had children who achieved higher in Verbal Originality and Average than did those of skilled clerical: sales/crafts (Levels 9-11).

In summation, the investigations of relationships between creativity and occupation of parents revealed none of significance for the mother and only a few for the father, with these only in the Verbal categories. Through the Pearson correlations and ANOVA, significant

relationships appeared for Verbal Flexibility, Originality and Average. In Verbal Creativity there were some significant differences among the occupational subgroups in their relationships to Verbal Fluency, Originality, and Average with children of technical/middle management fathers achieving higher scores.

Thus, Hypothesis No. 5.2 that there is no significant relationship between creativity and the socioeconomic status of the family as determined by the occupation of each/either parent, is accepted for the mothers and partially rejected for the fathers. For the fathers, the hypothesis is accepted for Figural Creativity but not for Verbal Creativity.

Creativity and Educational Levels of Parents

Research Question No. 5.3. Is there a relationship between creativity and the educational level of each/either parent?

In answering this question, results of the Pearson correlations and ANOVA were examined. The highest educational levels attained by each parent were first tallied in six levels as in Table 3.7, but for statistical purposes they were grouped into four levels, as noted in the tables for this section.

Tables 4.15 and 4.16 show the children's TTCT mean scores for each of the four levels of education of the mother and father respectively. Underlined scores are those that are highest per creativity category.

In the Pearson correlations between the children's TTCT creativity scores and education of the parents, no significant correlations were found for the mother and only one was found for the father. In Figural Elaboration there were higher scores for children who had fathers with

Table 4.14

One-Way ANOVA Data for TTCT Creativity Scores and Occupation of Parents

	Mother			Father		
Category	*M*	*F*	*p*	*M*	*F*	*p*
Figural						
Flu	83.4	.49	.81	83.3	.90	.49
Or	90.7	1.01	.43	90.9	.62	.69
Ti	108.7	.43	.86	108.6	1.57	.18
El	90.4	.36	.90	90.2	1.01	.42
Cl	96.9	.38	.89	97.0	.75	.59
Av	94.0	.59	.74	94.0	1.12	.36
Cl	103.1	.55	.76	103.0	1.32	.27
Verbal						
Flu	105.6	1.09	.38	106.2	1.38	.25
Fle	114.2	.44	.85	114.9	1.39	.25[a]
Or	93.8	1.29	.28	94.0	2.39	.05*
Av	104.5	.82	.53	105.0	1.92	.11[a]
N	60			58		

Note. df for mothers was 5; df for fathers was 4.

[a]These were significant in Pearson correlations, with *p*(VFle) = .01 and *p*(VAV) = .05.

*$p \leq .05$.

higher levels of education (p = .03).

With ANOVA, the results are shown in Table 4.17. No correlational probabilities were found to be less than .11 for either parent.

In summarizing, there was an overwhelming lack of significant relationships between creativity and the education of either parent. There was only one significant relationship (for Figural Elaboration for the father). Thus, Hypothesis No. 5.3, that there is no significant relationship between the creativity of the child and the educational background of the parents is generally supported.

Creativity and Number of Children in the Family

Research Question No. 5.4. Is there a relationship between creativity and the number of children in the family?

This question is investigated through the examination of the TTCT creativity scores, Pearson correlations, ANOVA, and the Duncan procedures. The creativity subtest scores are recorded for subjects who had one, two, three, or four to eight children in the family.

Table 4.18 shows the mean creativity scores by the number of children in the family. The highest score for each creativity category is underlined for easier focus. In all the Verbal subtests, the children of larger families of 4 or more children, had the highest mean scores.

Table 4.19 includes the Pearson correlations of the TTCT creativity scores with the number of children in the family. For the Verbal subscores, the correlations were significant with the exception of Flexibility.

ANOVA results showed no significant differences but the Duncan procedures revealed some differences between groups. Children who came

Table 4.15

Mean TTCT Creativity Scores for Educational Level of Mother

	Educational Level[a]			
Category	1	2	3	4[b]
Figural				
Flu	87.3	82.9	82.4	82.4
Or	93.8	90.0	91.0	88.1
Ti	115.6	106.0	110.3	105.0
El	88.0	90.7	91.6	89.1
Cl	95.2	97.2	99.2	91.4
Av	96.0	93.4	94.9	91.1
CI	105.8	101.6	104.7	100.4
Verbal				
Flu	109.0	108.0	103.2	99.6
Fle	112.3	113.2	116.2	115.0
Or	98.7	94.4	92.3	89.3
Av	106.6	105.2	104.0	101.3
n	9	25	19	7

[a]1 = high school not completed, 2 = high school diploma, 3 = university undergraduate degree/post high school diploma, 4 = post-graduate/ Master's, Ph.D. or equivalent.

[b]Level 4 includes 2 doctorates.

Table 4.16

Mean TTCT Creativity Scores for Educational Level of Father

	Educational Level[a]			
Category	1	2	3	4[b]
Figural				
Flu	82.2	87.7	83.9	80.0
Or	85.0	96.2	93.2	87.4
Ti	109.4	100.4	114.4	109.2
El	88.0	88.7	90.0	92.7
Cl	93.7	97.8	100.6	94.6
Av	91.8	94.1	96.4	92.8
CI	100.6	103.1	105.5	101.9
Verbal				
Flu	109.6	108.8	106.1	102.6
Fle	116.6	108.0	117.8	116.6
Or	96.9	96.6	93.9	90.7
Av	107.7	104.4	105.9	103.4
n	9	14	17	18

[a]1 = high school not completed, 2 = high school diploma, 3 = university undergraduate degree or post-high school diploma, 4 = post-graduate/ Master's, Ph.D. or equivalent.

[b]Level 4 includes 7 doctorates.

Table 4.17

One-Way ANOVA Results for TTCT Creativity Scores and Educational Levels of Parents

	Mother		Father[a]	
Category	F[b]	p	F	p
Figural				
Flu	0.26	.85	0.75	.53
Or	0.21	.89	1.56	.21
Ti	0.99	.41	2.15	.11
El	0.55	.66	1.14	.34
Cl	0.43	.73	0.55	.65
Av	0.35	.79	0.50	.68
Cl	0.59	.63	0.47	.71
Verbal				
Flu	0.66	.58	0.46	.71
Fle	0.16	.92	1.08	.37
Or	0.67	.57	0.58	.63
Av	0.20	.89	0.21	.89
n	60		58	

Note. Four educational levels were used: high school not completed, high school diploma, post high school diploma/university undergraduate degree, and post-graduate/Master's/Ph.D or equivalent.

[a]The fathers of two children were not reported.

[b]df=3.

from families with four or more children appear to have significantly higher TTCT Verbal Fluency and Average creativity scores than those who are only children, and significantly higher Verbal Originality scores than those who come from two child families.

Thus, Hypothesis No. 5.4, that there is no relationship between creativity and the number of children in the family, is supported for Figural creativity but rejected for Verbal creativity.

Creativity and Birth Order

Research Question No. 5.5. Is there a relationship between creativity and birth order?

In responding to this, the mean creativity scores are tabulated and results of Pearson correlations, ANOVA, and Duncan procedures are presented. Birth order is shown in three groups for statistical purposes. ANOVA results are also given with number of children as covariate. Underlined scores are those that are highest for each creativity category.

Table 4.20 presents the mean TTCT creativity scores by birth order. It is interesting to note that whereas second born children have the highest means on nearly all of the figural subscores, third or later born children have the highest means on the Verbal subscores.

Pearson correlations, shown in Table 4.19, show significant correlations for Verbal creativity, in Fluency, Originality, and Average. No significant correlations appear on the Figural subscores.

In Table 4.21 the ANOVA results are given, for both birth order alone and with number of children as covariate. No significant relationships are revealed.

Table 4.18

Mean TTCT Creativity Scores by Number of Children in the Family

Category	No. of Children			
	1	2	3	4[a]
Figural				
Flu	85.3	84.3	81.2	81.2
Or	89.0	91.8	90.2	88.5
Ti	111.7	110.0	108.5	103.2
El	95.0	89.6	93.0	87.8
Cl	93.8	99.2	98.6	90.0
Av	95.2	95.0	94.3	90.3
CI	106.0	104.3	102.9	114.7
Verbal				
Flu	93.3	105.3	103.9	114.7
Fle	105.0	115.3	109.1	120.5
Or	90.5	92.7	89.7	102.5
Av	96.3	104.5	100.8	112.6
n	6	33	10	11

[a]Four to eight.

Table 4.19

Pearson Correlations Between TTCT Creativity Scores and Number of Children in the Family and Birth Order

Category	Children		Birth Order	
	r	p	r	p
Figural				
Flu	-.03	.42	.08	.28
Or	.02	.44	.10	.23
Ti	-.16	.11	-.10	.23
El	-.18	.08	-.14	.14
Cl	-.18	.09	-.17	.10
Av	-.14	.15	-.05	.35
CI	-.21	.06	-.09	.25
Verbal				
Flu	.24	.03*	.25	.03*
Fle	.13	.16	.15	.13
Or	.22	.05*	.31	.01*
Av	.22	.05*	.26	.02*
N	60		60	

*$p \leq .05$

Table 4.20

Mean TTCT Creativity Scores by Birth Order

Category	Birth Order 1	2	3[a]
Figural			
Flu	80.6	85.3	83.4
Or	88.1	92.1	91.9
Ti	107.9	110.9	104.0
El	91.4	89.8	90.0
Cl	95.7	99.6	91.4
Av	92.7	95.6	92.2
CI	101.7	105.0	100.4
Verbal			
Flu	100.1	106.4	114.9
Fle	111.6	113.9	120.6
Or	89.6	93.7	102.6
Av	100.5	104.7	112.6
n	21	29	10

[a]Birth order 3 to 8 inclusive.

Table 4.21

ANOVA Results for TTCT Creativity Scores by Birth Order and by Birth Order with Number of Children as Covariate

	Main Effects		With Covariate	
Category	F	P	F	P
Figural				
Flu	0.81	.45	0.04	.84
Or	0.52	.60	0.02	.89
Ti	0.44	.64	1.54	.22
El	0.56	.58	2.02	.16
Cl	0.72	.49	1.82	.18
Av	0.78	.46	1.07	.31
CI	1.13	.33	2.49	.12
Verbal				
Flu	0.94	.40	3.55	.07
Fle	0.46	.64	1.03	.31
Or	1.51	.23	3.04	.09
Av	1.12	.33	2.99	.09

*$p \leq .05$

Through the Duncan procedures, a few signifcant findings were made. It was found that children born third or later had three Verbal creativity subscores significantly higher than the first-born children, with these areas being Verbal Fluency, Originality, and Average.

In summarizing the relationships between creativity and birth order, there were none of significance for the Figural but there were three for the Verbal. Later birth order was related to higher TTCT creativity scores in Verbal Fluency, Originality, and Average. In between-group comparisons, those children born third or later had significantly higher creativity scores on these same three areas than did the first-borns.

Hence, Hypothesis No. 5.5, that there is no relationship between creativity and birth order, is supported for the Figural but rejected for all except Flexibility in the Verbal.

Creativity and Program

Research Question No. 6.

Is there a relationship between creativity and instructional program?

To answer this question, the TTCT mean scores and results of Pearson correlations and t-tests are presented. For examination of the TTCT means, program is divided into REG and IG, with IG subdivided into PO and FT for further information, as shown in Table 4.22. Inspection of Table 4.22 indicates that for all of the subscores, the highest means were obtained by students in the IG programs. Underlined scores are those that are highest for each creativity category.

Table 4.22

Mean TTCT Creativity Scores by Program

			Identified Gifted			
	Regular		Pullout		Full-Time	
Category	M	SD	M	SD	M	SD
Figural						
Flu	81.7	15.2	84.3	12.5	85.4	14.5
Or	87.3	15.0	96.9	15.7	92.1	13.0
Ti	101.2	13.9	109.6	12.1	120.6	14.1
El	90.0	7.4	90.5	4.8	91.0	9.0
Cl	91.2	15.9	104.5	18.6	101.2	10.0
Av	90.3	10.7	97.2	10.0	98.1	7.8
Cl	98.9	11.8	106.1	9.9	108.1	8.3
Verbal						
Flu	102.8	16.0	113.3	18.3	105.2	18.5
Fle	110.2	18.3	116.6	11.1	119.3	16.1
Or	90.7	9.6	101.7	21.7	93.6	12.8
Av	101.2	13.4	110.5	13.5	106.1	14.9
n	30		12		18	

Pearson correlations were run between TTCT creativity scores and program, with the higher numbered programs representing the IG. Table 4.23 shows that significant relationships were found, with students in IG programs scoring higher in four Figural areas, namely Titles, Closure, Average, and Creativity Index, and in one Verbal area, namely Flexibility.

T-test results are recorded in Table 4.24. Significant differences were found between the creativity results of students in REG and IG programs, with these all in the Figural area and with the IG higher in each case. These differences were found for Figural Titles, Closure, Average, and Creativity Index.

In summary, it would appear that students in the IG program scored significantly higher in several areas of Figural creativity and in Verbal Flexibility. Hence, Hypothesis No. 6, that there is no significant relationship between creativity and program, is generally accepted for Verbal creativity, but, contrary to the hypothesis, there appears to be a significant relationship between a number of Figural aspects of creativity and program.

Multiple Regression Results

This analysis was run with selected variables to determine if any could be used in predicting creativity. The independent variables used were VIQ, NVIQ, gender, age, occupation of mother, occupation of father, education of mother, education of father, number of children in the family, birth order, and program. The dependent variables to be predicted were Figural Average, Creativity Index, and Verbal Average.

Table 4.23

Pearson Correlations Between TTCT Creativity Scores and Program

Category	r	p
Figural		
Flu	.11	.19
Or	.16	.10
Ti	.53	.00*
El	.06	.33
Cl	.30	.01*
Av	.35	.00*
CI	.37	.00*
Verbal		
Flu	.08	.26
Fle	.24	.03*
Or	.12	.18
Av	.18	.09
N	60	

*$p \leq .05$.

Table 4.24

TTCT Creativity Test Means and T-Test Results for Regular and Identified Gifted Programs

	REG	IG	T[a]	p
Figural				
Flu	81.7	85.0	-0.87	.39
Or	87.3	94.0	-1.79	.08
Ti	101.2	116.2	-4.12	.00**
El	90.0	90.8	-0.42	.68
Cl	91.2	102.5	-2.95	.01**
Av	90.3	97.7	-2.98	.00**
CI	98.9	107.3	-3.12	.00**
Verbal				
Flu	102.8	108.4	-1.24	.22
Fle	110.2	118.2	-1.88	.07
Or	90.7	96.8	-1.71	.09
Av	101.2	107.9	-1.86	.07
n	30	30		

[a]df=58; pooled variance.

**$p \leq .05$, two-tailed.

Program was found to be an important predictor of creativity. The multiple regression results showed program as a significant predictor of Verbal Average (p=.035) and Creativity Index (p=.004), and as a strong predictor of Figural Average (p=.006). For Verbal Average, age was also found to be a predictor (p=.012), as may be seen in Table 4.25. Thus, both age and program were found to significantly predict Verbal Average.

Summary

The results of the research have been presented in detail. Each hypothesis has been tested and either accepted or rejected. Explanatory information, both written and tabular, has been given. A summary of significant findings is to be found in Chapter 5. The multiple regression analysis determined that of the three main creativity scores Verbal Average could be predicted by the student's age and/or instructional program, and Creativity Index and Figural Average can be predicted by program.

Table 4.25

Results of Multiple Regression Analysis to Predict TTCT Creativity Scores as Shown in Verbal Average

Variable	R^2	F(eqn)	SigF	R^2Ch	FCh	p	r
Age	.107	6.67	.012	.107	6.67	.012*	.326
Program	.176	5.88	.005	.070	4.65	.035*	.254
Gender							-.010
Birth order							.240
Occupation of mother							.091
Education of mother							-.131
NVIQ							.035
VIQ							.068
Occupation of father							.028
Education of father							-.079
No. of children							.184

Note. df=1 (regression) and df=56 (residual)

*$p \leq .05$

> The understanding and encouragement of creativity is crucial to the survival of humankind because survival requires self-renewal when conventional means for renewal become obsolete.
>
> M.K. Kitano & D.F. Kirby
> Gifted education:
> A comprehensive view

CHAPTER V

CONCLUSIONS

This study aimed to investigate relationships between creativity and selected variables in a sample of higher-ability Grade 5 students in the Edmonton area. Half of the students were in Identified Gifted programs and half in Regular classes, with a total of 31 girls and 29 boys. Creativity was measured by using the TTCT, both Figural and Verbal. The specific variables used with respect to each student were intelligence, academic achievement, gender, age, family structure, occupation and education of each parent, number of children in the family, birth order, and program.

Summary of the Findings

Table 5.1 presents a summary of the significant relationships found between creativity and the chosen variables. By including only the significant findings, a visual summation is readily available. Unless a negative sign is affixed, each S denotes a positive correlation. In the case of age, a further breakdown in analysis revealed a gender difference, with this being shown by a superscript g, b, or t representing girls, boys, and total group respectively.

Table 5.1

Significant Relationships Between TTCT Creativity Subscores[a] and all Variables Under Analysis

	Figural							Verbal			
Variable	Fu	Or	Ti	El	Cl	Av	CI	Fu	Fe	Or	Av
VIQ			S		S	S	S				
NIQ			S								
Achievement											
Language Arts			S								
Mathematics			S							S^-	
Social Studies											
Art								S	S	S	S
Music											
Physical Education											
Gender											
Age	S^g							S^{bt}	S^b	S^{bt}	S^{bt}
Occupation											
Mother											
Father									S		S
Education											
Mother											
Father				S							
No. of Children								S		S	S
Birth Order								S		S	S
Program			S		S	S	S		S		

Note. Significant Pearson results are denoted by S, with S^- indicating a negative direction, S^g for girls, S^b for boys, and S^t for the total group.

[a]Abbreviations have been altered in order to adapt to available space, with Fu=Flu, Fe=Fle.

The following discussion of Table 5.1 summarizes the findings with respect to each variable under study, relating them as well to the results of previous research in the specific areas. Unexpected findings are noted, possible explanations of the discrepancies are given, and comparisons are made with the related research. The results of the present study are in more detail than the other studies used in the review and, hence, some new perspectives may be indicated.

Creativity and Intelligence

As may be seen in Table 5.1, significant positive correlations were found between Verbal IQ and some aspects of Figural creativity, namely Titles, Closure, Average, and Creativity Index, but not for Verbal creativity. This result seems puzzling because, on face value, it would be expected that Verbal creativity and Verbal IQ would be more closely related than Figural creativity and Verbal IQ. Similarly, it is curious to note that Figural creativity was found not to be related to Nonverbal IQ, with the exception of the Titles subtest, but there is possibly a more verbal content to this subtest, and, hence, this may not be a strong finding.

Differing in part from the other research, the present study found some significant relationships between specific aspects of creativity and intelligence. Getzels and Jackson (1962) found a relatively low relationship between creativity and IQ, but in this study, more specific with regard to the breakdown of IQ and the creativity subscores, found significant relationships between Verbal IQ and some subtests of Figural creativity. The present sample would compare to the higher IQ students of the Yamamoto (1965) study, but he found lower correlations between

creativity and IQ for this group. The present study found significant relationships between Figural creativity and Verbal IQ, whereas Torrance's (1967) summary found a higher correlation between Verbal creativity and IQ. There is again the reminder that the Verbal/Figural TTCT components do not exactly match the Verbal/Nonverbal IQ components.

Creativity and Achievement

Table 5.1 shows that significant relationships between creativity and achievement were minimal. The correlations found were mainly for Verbal creativity, in Mathematics and in Art. The relationship found between Verbal creativity and Mathematics was negative, with this likely indicating that, not surprisingly, Mathematics scores are for factual, uncreative responses. The positive relationship between Art and only Verbal creativity, with this in all Verbal subtests, could relate to practice in, and appreciation by adults of, openness for divergent, unique responses more in verbal than in nonverbal areas. The only relationships between Figural creativity and achievement were found for Titles and both Mathematics and Language Arts. In explanation, the possibility exists that Titles has a notable verbal content and also a more convergent product, as in Mathematics; perhaps, too, we as teachers have stressed creative titles more than other dimensions of creative thinking. It was surprising that no strong relationships were found between creativity and such subject areas as Language Arts, Music, or even Social Studies, with the possible question being what percentage of the mark in each of these subjects actually represent creative endeavors.

In other studies, a few significant relationships were found, but the findings of this study were not consistent with theirs. Although Hocevar's (1976) study was of college students, he also found a relationship between creativity and both Fine Arts (Art) and Mathematics (with this in only two subtests in the current study); however, unlike his, the prsent study did not show a relationship between creativity and Music or a strong relationship with Language Arts. As in the Getzels and Jackson (1962) research, the present study showed little significant difference in achievement between the higher and lower creativity groups. It would seem that the very individualistic nature of creativity itself would lead to such a variety of tangible expressions that little consistency in correlation with academic achievement could reasonably be expected.

Creativity and Gender

No distinctive significant relationships were found between creativity and gender, as shown in Table 5.1. This finding is consistent with the literature, with Aldous (1973), for example, finding no gender differences in creativity.

Creativity and Age

Table 5.1 shows a significant correlation between Verbal creativity and age, but only minimally for Figural creativity. The relationship for the Verbal creativity was in all subtests, but for Figural creativity it was only for Fluency. These results would be somewhat expected since everyday interactions can develop Verbal creativity, whereas there seem to be fewer opportunities for development of Figural

creativity as a child proceeds into higher grades.

For creativity and age, there were significant relationships found in the present study, but little other research was located that was specific to this topic. The present study also showed that the significant correlation between Verbal creativity and age was due mainly to the boys' scores. The fourth grade slump could have affected some, varying according to the stresses and demands on the particular individual in the previous year. The gender difference does not, however, seem to be consistent with the relative state of development at the Grade 5 age.

Creativity and Family Circumstances

Creativity and Family Structure

No analysis was done on the relationship of creativity and family structure in that the sample, atypical for the population, was over 90% from two-parent families. This was also found in Barbe's (1964) study.

Creativity and Socioeconomic Status/Occupation of the Parents

Table 5.1 shows a significant correlation between Verbal creativity and occupation of the father but not for the mother, and no correlation between Figural creativity and the occupation of either parent. The Verbal scores of Flexibility and Average were those related to occupation of the father. It is interesting to note that children of parents in highest level occupations do not have proportionately the highest creativity scores, but it can be reasoned that those in some of the professions have to narrow their focus considerably whereas many in the middle class jobs have to be more creative in meeting the needs of

work and home.

The research also indicated that the middle class families were likely to have the more creative children. The study by Getzels and Jackson (1962), for example, found that the fathers of highly creative children were likely to be in business and that the mothers were likely to be employed on a full- or part-time basis.

Creativity and Education of the Parents

From Table 5.1 it would appear that no significant correlation was found between creativity and the education of either parent, with the small exception of one Figural subtest, Elaboration, relating to the education of the father. The lack of correlation seems unexpected, especially in the Verbal area, yet perhaps the creativity comes in out-of-school pursuits, including how to earn a living. Furthermore, with increased attention to creativity in our teaching, perhaps these children, as future parents, will show both higher educational levels and creativity.

In the related research, the Getzels and Jackson (1962) study, for example, showed that the higher creativity group had less specialization of training than did the high IQ group, with this related to the finding in this study in that their subjects were all of higher ability.

Creativity and Number of Children in the Family

From Table 5.1 it is noted that there is a significant correlation between number of children in the family and Verbal creativity, with this in Fluency , Originality, and Average. Counter to the belief by some that only children or children in smaller families have greater

opportunities to develop creativity, this study shows that more verbal creativity is developed in larger families. A possible explanation is that this is a result of the interplay of more competitive everyday living and more opportunities for the development of creativity in this sample from homes of at least middle class socioeconomic status.

The finding of the present study is not consistent with other research. Albert and Runco (1986), for example, found that the creative child is often an only child.

Creativity and Birth Order

As shown in Table 5.1 there is a significant relationship between birth order and Verbal creativity. The subtests included are Fluency, Originality, and Average, with these the same as for number of children in the family. Again, it may be surprising that the first born are not the most creative, but a possible explanation is the interplay in the larger family, combined with the higher socioeconomic level of the home and the select nature of the sample.

Most of the research has had different findings, with the first born probably the most creative. The study by Barbe (1964) and that by Albert and Runco (1986) both came to this conclusion. The current study, however, showed that the children of families of three or more had the highest Verbal creativity.

Creativity and Program

As shown in Table 5.1, a relationship exists between program and Figural creativity, but to only a minimal extent with Verbal creativity. In the Figural the correlations are with the Titles, Closure, Average,

and Creativity Index, and only with Flexibility in the Verbal. It could be expected that there would be a higher correlation with the Verbal, especially in more traditional school settings, but perhaps the IG program is offering more Figural opportunities to students.

Only limited research was available and, in that it was difficult to equate programs, no definitive comparison could be made. In the Bachtold (1974) study, the part-time learning center students had higher creativity scores than did those in special classes or enrichment, whereas the Pullout and Fulltime students in the present study had significantly higher creativity scores. The Fulltime and the special classes would be expected to have higher scores in that creativity is likely one of the components of such a program and the enrichment possibly would not offer a very broad scope.

In summary, some previous research with respect to creativity was supported, some rejected, and in a few cases perhaps new findings were made. Although no overall relationship was found with intelligence, the breakdown of IQ into verbal and nonverbal gave more specific information. Achievement relationships showed some variation, but a strong relationship only in Art. Gender showed no consistent relationships, except within age groups. Relationships were found for age. No analysis was made of family structure because the large majority of subjects were from two-parent families. For occupation and education of the parents, some relationships were found for the father; none were found for the mother. In number of children in the family and birth order, the present study found later borns to be more creative, with this different from earlier studies. Lastly, program was found to

be strongly related to creativity.

Implications of the Study

The main thrust of this study was toward implications for education, with the healthy social/emotional growth of the individual a concomitant part. Areas for which there may be practical applications include teaching methodology, curriculum, program design, use of creativity test results, and further research.

Teaching methodology can include more flexible, creative approaches. With the belief that creativity can be taught, original approaches to learning can be practiced. Guidelines are available for developing this skill and the rewards can be the student's excitement about school. The teacher can become a facilitator rather than a dispenser of knowledge. Both the teacher and the student can become more creatively productive.

In curriculum, creative thinking is said by some to be at the heart of basic education. With input from students, problems can be formulated in many subject areas and can be phrased/presented in such a way that they are meaningful to the students in their particular settings, cultural and environmental. Practicing a more creative problem-solving approach, higher level thinking skills can be developed, including application of learned processes in new situations and the generation of new ideas, with these being necessary skills for everyday living. It is important to broaden knowledge, not just recycle the old.

More multiple alternative programs need to be put into effect to provide outlets for the nurture of creativity in children. The available government funding should be used to maximum advantage. For

special programs, a Renzulli-style revolving door model can permit more students to be involved, for example, some of the highly creative REG program students of this study. As found in this study, the current PO and FT gifted programs now have the students with higher creativity. The more oral sharing approach to learning, usual in these programs, has an incremental effect, with students gaining quickly from the hitch-hiking on the ideas of others. Such programs have further benefits in the positive social emotional development of the students.

The results of creativity testing can have greater application than just for statistics. They can be used in individualized instructional planning, noting and using the strengths to develop the weaker areas. Teachers can add this information to other data to gain a better composite picture of the individual, and subsequent better understanding. The commercial marking and computerized test results are recommended, with group data also being provided.

Another important application of the results of this study can be in stimulating further research. The study of how gifted/creative people think rather than the study of gifted persons needs further research. Other correlational studies could be done, with modifications such as using a different IQ test, a personality inventory, an adaptability test, and determining the ages of the parents. Relationships using threshold IQ could also be added, with the data to be considered in selecting students for special programs. A pre/post study could be undertaken, with the treatment being a program in creative thinking and/or creative problem-solving. Longitudinal studies could be commenced to determine changes, for example in this sample. Studies

that can have practical applications are needed to aid in our educational processes.

In conclusion, if creativity is truly valued, education needs to include more opportunities for its development. New insights in this area hopefully have been added by this study. In the words of Toynbee, cited in Gallagher (1985:313), "To give a fair chance to potential creativity is a matter of life and death for any society."

References

Albert, R.S. & Runco, M.A. (1986). Achievement of eminence: A model based on a longitudinal study of exceptionally gifted boys and their families. In R.J. Sternberg & J.E. Davidson (Eds.), Conceptions of Giftedness (pp. 332-357). NY: Cambridge University Press.

Alberta Education. (1983). Educating gifted and talented pupils in Alberta: Summary report of the Minister's task force on gifted and talented pupils. Edmonton, AB.

Alberta Education. (1986). Educating our gifted and talented students in Alberta: A resource manual for teachers. Edmonton: Special Education Services.

Aldous, J. (1973). Family background factors and originality in children. Gifted Child Quarterly, 17(3), 183-192. (ERIC Document Reproduction Service, No. ED 129 013, Abstract No. 865)

Amabile, T.M. (1983). The social psychology of creativity. NY: Springer-Verlag.

Bachtold, L.M. (1974). Effects of learning environment on verbal creativity of gifted students. Psychology in the Schools 7(2), 226-228. (ERIC Document Reproduction Serivce No. ED 129 013, Abstract No. 1084)

Barbe, W.B. (1964). One in a thousand: A comparative study of highly and moderately gifted elementary school children. Columbus, OH: Columbus Blank Book.

Barron, F. (1969). Creative person and creative process. NY: Holt, Rinehart and Winston.

Belcastro, F.P. (1987). Elementary pullout program for the intellectually gifted -- Boon or bane? Roeper Review, 9, 208-212.

Butterfield, S.M. (Ed.) (1981). Faces and forms of creativity: Proceedings of the First National Conference on Creativity and the Gifted/Talented. Ventura, CA: Ventura County Superintendent of Schools Office.

Clark, B. (1979). Growing up gifted: Developing the potential of children at home and at school. Columbus, OH: Merrill.

Clark, B. (1983). Growing up gifted: Developing the potential of children at home and at school (2nd ed.). Columbus, OH: C. E. Merrill.

Clark, S.C.T. (1987). Creativity. AGATE: Journal of the Gifted and Talented Education Council of the Alberta Teacher's Association, 1(2), 7-12.

Edwards, B. (1986). Drawing on the artist within. NY: Simon and Schuster.

Ehrlich, V.Z. (1982). Gifted children: A guide for parents and teachers. Englewood Cliffs, NJ: Prentice-Hall.

Gallagher, J.J. (1975). Teaching the gifted child. (2rd ed.). Boston: Allyn and Bacon.

Gallagher, J.J. (1985). Teaching the gifted child (3rd ed.). Boston: Allyn and Bacon.

Getzels, J.W. & Jackson, P.W. (1962). Creativity and intelligence: Explorations with gifted students. NY: John Wiley and Sons.

Getzels, J.W. & Jackson, P.W. (1970). The highly intelligent and the highly creative. In P.E. Vernon (Ed.), Creativity, pp. 189-202.

Gold, M. (1982). Education of the gifted/talented. Ventura, CA: Ventura County Superintendent of Schools Office.

Gowan, J.C. (1964). Development of the creative individual. San Diego: R.R. Knapp.

Gowan, J.C. (1972). Development of the creative individual (2nd ed.). San Diego: R.R. Knapp.

Guilford, J.P. (1971). Some misconceptions regarding measurement of creative talents. Journal of Creative Behavior, 5(2), 77-87.

Guilford, J.P. (1975). Varieties of creative giftedness, their measurement and development. Gifted Child Quarterly, 19, 107-121.

Guilford, J.P. (1977). Way beyond the IQ. Buffalo, NY: Creative Education Foundation.

Harman, W. & Rheingold, H. (1984). Higher Creativity: Liberating the Unconscious for Breakthrough Insights. Los Angeles: Jeremy P. Tarcher.

Hocevar, D. (1976). Dimensionality of creativity. Psychological Reports, 39, 869-870.

Hocevar, D. (1980). Intelligence, divergent thinking, and creativity. Intelligence, 4, 25-40.

Jarial, G.S. (1985). Creativity and birth order. Journal of Creative Behavior, 19(2), 139. (Abstract).

Khatena, J. (1987). Dust to divinity: An obituary for John Gowan. Gifted Child Quarterly, 31(3), 138-140.

Kitano, M.K., & Kirby, D.F. (1986). Gifted education: A comprehensive view. Boston: Little, Brown and Company.

Kogan, N., & Pankove, E. (1972). Creative ability over a five year span. Child Development, 43, 427-442.

Krippner, S. (1983). A systems approach to creativity based on Jungian typology. Gifted Child Quarterly, 27(2), 86-89.

MacKinnon, D.W. (1978). In search of human effectiveness. Buffalo, NY: Creative Education Foundation.

Maslow, A. (1971). The farther reaches of human nature. NY: Viking Press.

May, R. (1975). The Courage to Create. NY: W.W. Norton.

Nuttall, D.L. (1984). In P. Levy & H. Goldstein (Eds.). Tests in education: A book of critical reviews, 567-672.

Pineo, P.C. (1985). Revisions of the Pineo-Porter-McRoberts Socioeconomic Classification of Occupations for the 1981 Census. Unpublished paper, McMaster University, Hamilton, Ontario.

Razik, T.A. (1970). Psychometric measures of creativity. In P.E. Vernon (Ed.), Creativity: Selected Readings, (pp. 115-166). Harmondsworth, Middlesex, England: Penguin.

Renzulli, J.S. (1978). What makes giftedness? Reexamining a definition. Phi Delta Kappan, 60(3). 180-184.

Runco, M.A. (1986). Divergent thinking and creative performance in gifted and nongifted children. Educational and Psychological Measurement, 46, 375-384.

Sattler, J.M. (1982). Assessment of children's intelligence and special abilities (2nd ed.). Boston: Allyn and Bacon.

Statistics Canada (1988).

Swassing, R. H. (1985). Teaching gifted children and adolescents. Columbus, OH: C. E. Merrill.

Tannenbaum, A.J. (1983). Gifted children: Psychological and Educational Perspectives. NY: Macmillan.

Tiedt, S.W. (1976). Creativity. Morristown, NJ: General Learning Press.

Torrance, E.P. (1967). The Minnesota studies of creative behavior: National and international extensions. Journal of Creative Behavior, 1(2). 137-154.

Torrance, E.P. (1974a). Torrance tests of creative thinking: Norms-Technical manual. Bensenville, IL: Scholastic Testing Service.

Torrance, E.P. (1974b). Torrance tests of creative thinking: Directions manual and scoring guide. Bensenville, IL: Scholastic Testing Service.

Torrance, E.P. (1977). Creatively gifted and disadvantaged gifted students. In J.C. Stanley, W.C. George, and C.H. Solano (Eds.), The gifted and the creative: A fifty-year perspective (pp. 173-196). Baltimore: John Hopkins University Press.

Torrance, E.P. (1979). The search for satori and creativity. Buffalo, NY: Creative Education Foundation.

Torrance, E.P. & Ball, O.E. (1984). Torrance tests of creative thinking: Streamlined (revised) manual, Figural A and B. Bensenville, IL: Scholastic Testing Service.

Torrance, E. P. & Hall, L. K. (1981). Assessing the further reaches of creative potential. In Faces and forms of creativity: Proceedings of the first national conference on creativity and the gifted/talented. Ventura, CA: Superintendent of Schools Office.

Tuttle, F.B., Jr., & Becker, L.A. (1980). Characteristics and identification of gifted and talented students. In F.B. Tuttle, Jr., (Ed.), Teaching the gifted and talented in the content area series. Washington, DC: National Education Assocation. (ERIC Document Reproduction Service No. ED 197 519)

Van Oech, R. (1986). A kick in the seat of the pants. NY: Harper and Row.

Wade, S. (1968). Differences between intelligence and creativity: Some speculation on the role of environment. Journal of Creative Behavior, 2(2), 97-101.

Wallach, M.A. (1976). Tests tell us little about talent. American Scientist, 64, 57.

Wechsler, D. (1974). Manual for the Wechsler Intelligence Scale for Children-Revised. NY: Psychological Corporation.

Williams, J.D., Teubner, J., & Harlow, S.D. (1973). Creativity in Rural, Urban, and Indian Children. Journal of Psychology, 83(1), 111-116. (From Abstract 892, Microfiche ED 129 013).

Wright, C. (1987). Nurturing creative potential: An interactive model for home and school. The Creative Child and Adult Quarterly, 12, 31-38.

Yamamoto, K. (1965). Effects of restriction of range and test unreliability on correlation between measures of intelligence and creative thinking. British Journal of Educational Psychology, 35, 300-305.

Yamamoto, K. (1967). Creative thinking: Some thoughts on research. In J.C. Gowan, G.D. Demos, & E.P. Torrance (Eds.), Creativity: Its educational implications (pp. 308-319). NY: John Wiley and Sons.

APPENDIX A

Letter of Consent

Department of Educational Psychology,
University of Alberta,
Edmonton, Alta.,
April 28, 1986

Dear Parents/Guardians of _____.

We are conducting a survey of creativity in higher-ability students in the vicinity of Edmonton. Your child has been chosen for study.

The process will entail about two hours with the selected students in a group situation, in their own school. It is seatwork activity that should prove to be both enjoyable and educational. The project, currently underway, will hopefully be completed by the end of May, 1986. The results after processing should give us further insight into the use of creativity as a factor in the identification of students for special programs, particularly those for the gifted and talented.

The background information to be used in accumulating the necessary data will be kept in confidence. Names and schools will be coded. The educational background and current occupation of each parent, the number of children in the family, and the child's history of illnesses will be considered.

Please complete the attached form and indicate your consent for your child's participation in this study. Thank you for your interest and for your prompt return of this form to your child's teacher.

Yours very truly,

(Mrs.) Margaret L. Davison
Graduate Student/Teacher

• • • • • • • • • • • •

I hereby grant permission for my child, _____
(Child's name in full)
to participate in the above study.

	Highest Level of Education Attained	Current Occupation (Type of Work)
Father/Male Guardian		
Mother/Female Guardian		

Number of children in the family _____ Birth order of above child ____

	Age			
	Before 2	3 - 6	7 - 9	10 - 12
Specific Illnesses				

_____
(Signature of Parent or Guardian)

APPENDIX B

TTCT Testing Form

TTCT TESTING FORM

School _____ Date _____ Tester _____

Preparation of Space - Arrange separate areas. For example, use opened books as dividers on a desk.

Warm-up Exercises - See separate sheet. Create a comfortable atmosphere.

Testing

A. Figural, Form ___

	F1	F2	F3
Time (min.)	10	10	10
Finished	_____	_____	_____
Started	_____	_____	_____

(Sharpen pencils; stretch!)

B. Verbal, Form ___

	V1	V2	V3	V4	V5	V6	V7
Time (min.)	5	5	5	10	10	5	5
Finished	_____	_____	_____	_____	_____	_____	_____
Started	_____	_____	_____	_____	_____	_____	_____

Names	Group (PEG, PO, FT)	Permission	Data
_____	____	____	____
_____	____	____	____
_____	____	____	____
_____	____	____	____
_____	____	____	____
_____	____	____	____
_____	____	____	____
_____	____	____	____
_____	____	____	____
_____	____	____	____
_____	____	____	____

nd/5/86

APPENDIX C

Preparation for Testing

Preparation for Testing (about 5 min.)

A. Physical Setting

Everyone seated comfortably

Lights lowered

Soft voice of leader

Materials organized

- Figural and Verbal booklets; toy elephant
- Newsprint (one sheet per student)
- Spare pencil, eraser

B. Relaxation Exercises

Close your eyes

Breathe in slowly to the count of five. (Count quietly.) Breathe out to the count of five. Sense the feeling in your lungs as they expand/contract. Do this three times.

Pretend that you are in your favorite place. (Pause)
What do you see? (Pause)
What do you hear? (Pause)
Think about how this makes you feel. (Pause)

Slowly open your eyes. You should feel very relaxed.

C. On the piece of newsprint I'd like you to write your name in letters as big as possible. Let your arm go really free. Then just leave this on your table beside you so I can get to know your names.

D. Proceed with the testing.

At the end of each section, where appropriate, check that there is a title for <u>each</u> picture drawn. Allow time if necessary.

Smiles of encouragement promote a facilitating environment!

APPENDIX D

Information Form

Student _____ Sex ___ Birthdate _____ Age (May 1/86) ____

School _____ No. of Children in Family ____ Birth Order __

Special Program? _____ Highest Level of Education Attained | Current Occupation (Type of Work)

Male Parent/Guardian _____

Female Parent/Guardian _____

(Please underline status) _____

Age

	Before 2	3 - 6	7 - 9	10 -12
Specific Illnesses				

Intelligence Test IQ: V ___
Type of Test Q ___
NV ___
Date Given _____

Achievement Tests Results (%iles): V (Vocab) ____ EPSB - Gr. 4 %iles
Type: C.T.B.S. R (Rdg Comp) ____ Rdg. - Dec. ____
or _____ M-1 (Math) ____ Comp. ____
Date Given _____ Grade ____ W-1 (Study Skills) ____ Math. ____
Mean ____

Report-Card Marks (6/85) L.A. ____
Math. ____
(If letter grades, what is the range of "A"? _____) Soc.St. ____
Sc. ____
Art ____
Music ____
P.E. ____ Mean __

Family Structure (Check)
Mother and father ___
Father and mother ___
Mother only ___
Father only ___
Mother and stepfather ___
Father and stepmother ___
Guardian(s)
Married couple ___
Female only ___
Male only ___
Other ___ (Describe)

Attendance (Satisfactory/Not Satisfactory)
(Underline one)

Comments

Is the child adopted? ___

* *

Research Data

Observation Score ____ Code ____

TTCT Scores: V ____; F ____; Index ____

APPENDIX E

Socioeconomic Classification of Occupations

Revised Pineo-Porter-McRoberts Socioeconomic Classification of Occupations for the 1981 Census

The 1981 Census unit groups were as follows:

1. Self employed professionals
2. Employed professionals
3. High level management
4. Semi professionals
5. Technicians
6. Middle management
7. Supervisors
8. Foremen and women
9. Skilled clerical sales and service
10. Skilled crafts and trades
11. Farmers
12. Semi skilled clerical sales and service
13. Semi skilled manual
14. Unskilled clerical sales and service
15. Unskilled manual
16. Farm laborers

Source: Pineo, P.C. Revisions of the Pineo-Porter-McRoberts Socioeconomic Classification of Occupations for the 1980 Census (QSEP Research Report No. 125). Hamilton, ON: McMaster University.

APPENDIX F

Statistics Canada Information

Population of Metropolitan Edmonton by Education Level

	Males		Females		Total	
Level[a]	f	%	f	%	f	%
1	27,485	9.2	30,465	10.1	57,955	9.7
2	82,515	27.8	91,960	30.5	174,475	29.2
3	27,700	9.3	38,820	12.9	66,525	11.1
4	88,685	29.8	78,115	25.9	166,795	27.9
5	31,035	10.4	30.210	10.0	61,245	10.2
6	39,770	13.3	31,585	10.5	71,360	11.9
Total	297,200	49.7	301,155	50.3	598,355	100

Note: The population figures are from the 1986 census (Statistics Canada), and are rounded to the nearer 5. The age counted is $\geq$ 15. The percentages have been added.

[a]Educational levels have been coded as follows:
1 = $<$ Grade 9
2 = Grade 9-13, without secondary diploma
3 = Grade 9-13, with secondary diploma
4 = Trade certificate, diploma, or other non-university diploma
5 = University without degree
6 = University with degree

APPENDIX G

Raw Data

ID	GENDER	SCHOOL	FFLUENT	FORIG	FTITLE	FELAB	CLOSE	FAVE	INDEX
1	1	1	91	107	125	90	130	109	115
2	1	1	74	97	100	84	91	89	95
3	1	1	89	97	115	90	95	97	109
4	1	1	108	113	105	90	91	101	107
5	2	1	74	90	105	96	87	90	103
6	2	1	100	116	115	96	134	112	124
7	2	1	96	116	125	90	96	105	113
8	1	1	91	110	110	90	87	98	105
9	1	1	93	100	95	84	77	90	94
10	1	1	93	116	125	84	110	106	114
11	1	2	110	80	125	84	101	100	112
12	2	2	55	70	90	90	91	81	91
13	2	2	96	100	110	90	91	93	111
14	2	2	93	97	110	96	115	102	111
15	2	2	86	103	105	84	110	93	109
16	1	2	94	100	90	96	105	93	106
17	1	2	74	74	95	90	105	83	95
18	1	2	96	97	120	84	101	100	109
19	1	2	81	80	110	108	96	95	104
20	2	2	89	97	125	90	120	104	112
21	2	3	70	80	120	72	87	85	93
22	1	3	84	84	125	102	115	102	111
23	1	3	79	93	135	96	96	100	111
24	2	3	72	77	115	108	91	93	106
25	1	3	70	77	115	96	105	93	106
26	1	3	91	100	100	96	105	99	106
27	2	3	122	110	115	90	105	110	120
28	2	3	86	80	125	102	101	99	109
29	2	3	100	116	160	96	105	115	129
31	2	4	77	93	105	84	87	89	97
32	2	4	67	70	95	90	77	90	98
33	2	4	65	67	95	96	77	80	92
34	2	4	93	97	85	90	106	94	100
35	2	4	81	90	95	90	87	89	99
36	1	4	81	87	90	72	82	82	86
37	2	4	84	97	95	84	106	93	101
38	2	4	93	100	130	96	115	103	116
39	1	4	67	77	95	90	72	90	97
40	1	4	70	87	95	84	88	81	91
41	1	5	96	100	115	84	110	101	107
42	1	5	74	84	140	84	101	97	107
43	1	5	77	93	115	90	96	94	108
44	1	5	91	110	115	78	95	93	104
45	2	5	89	97	130	90	95	100	107
46	2	5	70	80	105	84	82	86	95
47	1	5	79	80	105	96	101	92	103
48	1	5	84	87	115	90	101	95	105
49	2	5	95	110	120	84	125	107	118
51	2	6	55	70	85	102	77	80	89
52	2	6	60	70	110	90	91	84	91
53	2	6	67	84	105	90	82	86	94
54	1	6	70	64	95	90	77	79	88
55	2	6	60	70	85	84	63	72	81
56	1	6	98	100	95	96	130	104	118
57	2	6	67	77	90	96	72	79	88
61	1	7	55	61	70	84	72	70	76
62	1	7	81	90	105	84	101	92	103
63	2	7	72	67	105	90	105	88	93
64	1	7	105	107	125	108	115	115	124
65	1	7	74	97	100	90	91	90	98

ID	VFLUENT	VFLEX	VORIG	VAVE	AGE	VIQ	NIQ
1	101	108	83	97	11.00	127	115
2	107	117	86	103	10.67	112	111
3	95	115	91	100	10.67	105	117
4	80	77	77	78	10.58	115	105
5	116	127	88	110	11.08	123	125
6	84	100	87	90	10.67	125	133
7	99	121	91	104	10.67	109	119
8	97	121	89	102	10.42	133	113
9	114	115	105	111	11.08	118	105
10	98	117	102	106	10.67	126	136
11	102	96	80	93	11.90	118	102
12	89	100	80	90	10.33	118	118
13	128	98	81	102	10.58	109	114
14	115	104	102	107	10.50	118	118
15	127	108	89	108	10.83	134	130
16	121	121	89	110	10.67	125	114
17	116	131	102	116	10.58	130	106
18	115	119	93	109	10.17	118	107
19	99	96	84	93	10.33	114	114
20	105	127	94	109	10.50	133	100
21	85	94	84	88	10.67	113	123
22	103	127	93	108	10.75	129	130
23	127	138	91	119	10.67	132	119
24	103	119	93	105	10.58	128	117
25	83	108	82	91	10.17	140	147
26	134	142	107	128	10.17	134	112
27	85	94	93	91	10.33	134	132
28	82	96	84	87	10.58	130	140
29	149	150	137	145	10.92	124	130
31	135	134	144	128	11.17	124	119
32	116	125	97	113	10.83	97	120
33	146	127	143	140	11.17	120	127
34	130	129	103	121	11.17	115	113
35	95	94	89	93	10.50	119	138
36	82	81	82	82	10.33	115	115
37	97	104	82	94	11.17	99	120
38	137	138	103	126	10.83	127	109
39	116	129	114	120	10.58	106	113
40	99	110	91	100	11.00	116	115
41	105	115	87	102	10.83	120	140
42	96	123	91	103	11.00	125	140
43	109	125	95	110	10.33	150	147
44	122	125	102	116	10.67	133	125
45	90	110	84	95	9.17	140	128
46	99	113	81	98	10.42	135	147
47	114	129	98	114	10.33	130	134
48	106	131	93	110	10.42	122	143
49	101	108	90	100	10.58	141	140
51	86	104	82	91	10.33	118	121
52	105	127	91	108	10.58	132	122
53	86	102	89	92	10.58	124	113
54	96	98	94	96	10.25	120	132
55	94	94	89	92	10.83	114	105
56	118	131	103	117	10.67	119	111
57	106	119	93	106	10.50	137	137
61	71	83	81	78	10.25	122	106
62	114	152	98	121	11.08	125	132
63	76	85	76	79	10.33	134	121
64	110	123	92	108	10.50	116	115
65	121	129	107	119	10.50	117	115

ID	LA	MA	SS	ART	NU	PE
1	1	1	1	1	1	1
2	2	2	1	1	1	1
3	2	2	2	2	2	1
4	2	2	2	2	2	1
5	1	1	1	1	1	1
6	1	1	1	1	1	1
7	2	2	2	1	2	1
8	2	1	2	1	2	1
9	2	2	1	1	2	1
10	2	2	2	2	2	1
11	2	1	1	1	2	1
12	2	2	2	2	1	2
13	2	1	2	2	2	2
14	2	1	2	1	2	2
15	1	1	2	1	2	1
16	2	1	1	2	1	2
17	2	2	2	1	2	2
18	2	2	2	2	1	2
19	2	2	2	2	2	2
20	2	1	2	2	2	2
21	1	1	2	2	2	2
22	1	1	2	1	1	2
23	1	1	1	1	1	1
24	1	1	1	2	2	2
25	1	1	2	1	2	2
26	2	2	1	2	2	2
27	1	1	2	2	2	2
28	1	1	1	1	2	1
29	1	1	1	1	2	1
31	2	2	1	1	2	1
32	1	2	1	2	2	1
33	1	1	2	1	2	1
34	2	1	1	2	2	1
35	2	2	1	1	2	1
36	2	2	1	1	2	1
37	2	2	1	2	2	1
38	2	2	1	1	2	1
39	1	2	1	2	2	1
40	1	1	1	1	2	1
41	1	1	1	1	2	1
42	1	1	1	2	1	1
43	1	1	1	1	2	1
44	1	1	1	1	1	2
45	1	1	2	1	2	2
46	1	1	1	2	1	2
47	2	1	1	2	2	2
48	1	2	1	2	1	2
49	1	1	1	1	2	2
51	2	1	1	2	1	2
52	1	1	2	2	2	1
53	1	1	2	2	2	1
54	2	1	1	2	1	2
55	2	1	2	2	2	2
56	2	1	1	2	2	2
57	2	1	2	2	2	2
61	2	1	1	2	1	2
62	1	2	2	2	2	1
63	1	1	1	2	2	1
64	2	1	1	2	2	1
65	2	2	2	2	2	1

ID	ATT	FAMS	EDFATH	EDMOTH	OCCFATH	OCCMOTH	CHILD	BIRTH	ILL
1	1	2	3	2	1	3	3	3	0
2	1	2	2	1	4	7	4	2	0
3	1	2	2	1	3	3	5	5	0
4	1	2	2	2	2	2	2	1	0
5	1	2	4	4	2	1	2	1	0
6	1	2	2	3	1	1	2	2	0
7	1	2	2	3	3	3	2	1	0
8	1	2	4	3	2	2	2	2	1
9	1	2	4	2	1	7	8	8	0
10	2	2	3	2	1	4	2	2	0
11	1	2	1	1	6	4	2	2	0
12	1	2	3	2	3	4	2	2	0
13	1	2	2	3	3	7	2	2	0
14	1	2	3	2	2	7	3	2	0
15	1	2	2	2	4	4	2	2	0
16	1	2	2	2	4	4	2	1	0
17	1	2	1	2	4	4	2	1	1
18	1	2	1	1	3	4	4	2	0
19	1	1	3	2	6	7	3	1	0
20	1	2	3	3	1	7	4	2	0
21	1	2	4	4	1	1	2	2	1
22	2	2	4	3	1	7	2	1	1
23	1	2	3	2	1	7	3	2	0
24	1	2	4	3	1	1	1	1	0
25	1	2	4	3	1	1	2	2	1
26	1	1	4	2	2	4	2	2	1
27	2	2	3	4	1	1	1	2	0
28	1	1	.	1	.	4	1	1	1
29	1	2	1	1	3	4	2	2	0
31	1	2	2	1	3	3	2	2	1
32	1	2	1	2	4	7	4	4	1
33	1	2	2	2	3	4	4	4	0
34	1	2	2	2	3	4	4	3	1
35	1	1	.	3	.	1	1	1	0
36	1	2	2	2	4	7	2	1	1
37	1	2	1	1	4	6	3	2	0
38	1	2	3	2	4	7	2	2	0
39	1	2	1	3	4	4	4	4	0
40	1	2	1	1	4	4	3	3	1
41	1	2	4	4	1	1	2	1	0
42	1	2	3	2	2	6	2	1	0
43	1	2	3	2	2	7	1	1	0
44	1	2	3	3	1	1	5	5	0
45	1	2	4	2	2	6	2	2	1
46	1	2	4	3	1	2	2	1	1
47	1	2	4	3	2	6	2	1	0
48	1	2	3	3	3	1	2	2	0
49	1	2	4	3	4	2	2	1	1
51	1	2	4	4	1	7	2	2	0
52	1	2	4	3	2	2	2	1	1
53	1	2	3	3	4	2	1	1	1
54	1	2	4	3	1	6	4	2	1
55	1	2	3	2	2	6	3	2	0
56	1	2	2	3	3	2	2	2	0
57	1	2	4	4	1	2	2	2	0
61	1	2	2	2	4	4	2	1	0
62	1	2	3	4	3	2	2	2	0
63	1	2	1	2	3	4	3	2	0
64	1	2	4	2	1	4	3	3	0
65	1	3	3	2	3	7	3	1	1